

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

PIONEER HI-BRED INTERNATIONAL,)	
INC. and E. I. DU PONT DE NEMOURS)	
AND COMPANY,)	
)	
Plaintiffs/Counterclaim-)	C.A. No. 22-1280-RGA
Defendants,)	
)	
v.)	
)	
SYNGENTA SEEDS, LLC,)	
)	
Defendant/Counterclaim)	
-Plaintiff.)	

JOINT CLAIM CONSTRUCTION BRIEF

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TABLE OF ABBREVIATIONS

Abbreviation	Description
'846 patent or '846	U.S. Patent No. 8,859,846
__:__	Citations to the '846 patent by column:line(s)
D.I. 58-1	U.S. Patent No. 8,859,846 (PNR_DH_00000001)
D.I. 58-2	Prosecution History for the '846 patent (produced as PNR_DH_00000012-458)
DH	doubled haploid
GFP	Green Fluorescent Protein
<i>Italics</i>	Emphasis added unless indicated otherwise
Ex. ____	Exhibit Number ____
Pioneer	Plaintiffs/Counterclaim-Defendants Pioneer Hi-Bred International, Inc. & E. I. du Pont de Nemours and Company
Syngenta	Defendant/Counterclaim-Plaintiff Syngenta Seeds, LLC

CONTENTS OF JOINT APPENDIX

Exhibit Number	Description
1	Prasanna et al., <i>Doubled haploid technology in maize breeding: theory and practice</i> , CIMMYT, 2012.
2	Gordon-Kamm et al., “Transformation of maize cells and regeneration of fertile transgenic plants,” <i>The Plant Cell</i> (1990) 2: 603-618.
3	Merriam-Webster, 11th Ed. (2005)
4	Declaration of Stephen P. Moose, dated July 12, 2023
5	U.S. Patent No. 8,980,632 (PNR_DH_00000507)

I. INTRODUCTION AND REPRESENTATIVE CLAIMS

A. Pioneer's Opening Introduction

Pursuant to Paragraph 8 of the Scheduling Order (D.I. 19), Plaintiffs Pioneer Hi-Bred International, Inc. and E. I. du Pont de Nemours and Company (collectively, "Pioneer") provide their Opening Brief in support of their proposed constructions for the disputed claim terms of U.S. Patent No. 8,859,846 ("the '846 patent," previously filed as D.I. 58-1). For reasons stated in more detail below, Pioneer respectfully requests that the Court adopt Pioneer's proposed constructions.

The parties' disputes concern following terms: claim 1, part (b) (highlighted in green), part (c) (in purple), part (d) (in yellow), and part (e) (in blue), as well as claim 5 (in orange), as shown below:

1. A method of obtaining a doubled haploid maize plant, said method comprising:

(a) pollinating silks of a maize ear with a maize inducer line to produce at least one diploid maize embryo and at least one haploid maize embryo;

(b) isolating said haploid maize embryo between 4-21 days after step (a), wherein said at least one haploid maize embryo is distinguished from the diploid maize embryos via expression of a marker;

(c) contacting said haploid maize embryo with a chromosome doubling agent to produce at least one doubled haploid maize embryo cell;

(d) culturing said doubled haploid maize embryo cell on a non-callus promoting medium; and

(e) generating a doubled haploid maize plant from said doubled haploid maize embryo cell.

5. The method of claim 2, wherein said marker gene is expressed 4 or more days after pollination.

Pioneer proposes construing the claims according to "their ordinary and customary meaning," which is the meaning they would have to a skilled artisan at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc). Syngenta's constructions, in contrast, seek to narrowly rewrite the claims, including by improperly applying

one element's timing limitation to other claim elements, refusing to apply straightforward claim differentiation, imposing an incorrect order of method steps contradicting the claims' open "comprising" language, and prematurely asserting indefiniteness and improper dependent claim challenges.

B. Syngenta's Answering Introduction

Syngenta's well-supported constructions convey the ordinary and customary meaning of each disputed claim term as a skilled artisan would understand them at the time of the invention. Pioneer, on the other hand, insists that construction of the disputed terms is unnecessary or, alternatively, seeks to rewrite aspects of the claims more broadly than the '846 patent's language supports. For the reasons below, Syngenta respectfully requests that the Court adopt Syngenta's proposed constructions.

C. Pioneer's Reply Introduction

Pioneer's proposed constructions provide the plain and ordinary meaning that each term would have to a skilled artisan at the time of the invention. Pioneer's constructions are also supported by the declaration of Dr. Stephen Moose, Professor at the University of Illinois and head of the Stephen Moose Corn Functional Genomics Lab. Ex. 4, ¶¶ 2-5.

Syngenta's constructions, in contrast, violate essentially every canon of claim construction, disregarding the plain language of the claims, ignoring straightforward application of claim differentiation, rendering claim terms superfluous, excluding preferred embodiments and examples from the specification, and reading optional limitations from the specification into the claims. Syngenta additionally seeks to impose a rigid order of steps in claim 1 that is unsupported by the claims, specification, and file history.

Pioneer respectfully requests that the Court adopt Pioneer's proposed constructions.

D. Syngenta's Sur-Reply Introduction

Syngenta proposes constructions based on the language and structure of Claim 1, consistent with intrinsic evidence; Pioneer ignores the claim language, claim structure, express definitions found in the specification, and seeks to expand the scope of the claim by misrepresenting the intrinsic evidence and relying on unsupported extrinsic evidence.

II. THE '846 PATENT

A. Pioneer's Opening Position

The '846 patent is directed to methods of obtaining doubled haploid maize (or corn) plants. Haploid maize plant cells have a single set of chromosomes instead of the two sets of chromosomes that normal diploid maize cells have. D.I. 58-1 at 1:33-49. A haploid set of chromosomes may be doubled to produce a genetically uniform (homozygous) plant having two identical sets of chromosomes, referred to as a doubled haploid or "DH" maize plant. The DH methods shorten the maize breeding cycle, as homozygous lines of maize plants may be developed in just two generations as compared to the 6-8 generations using conventional processes, as shown below. Ex. 1 at 1. Those inbred DH plants may then be used in maize breeding programs, providing for controlled evaluation of genetic combinations of one inbred maize plant with another in efforts to generate new, improved maize plants.

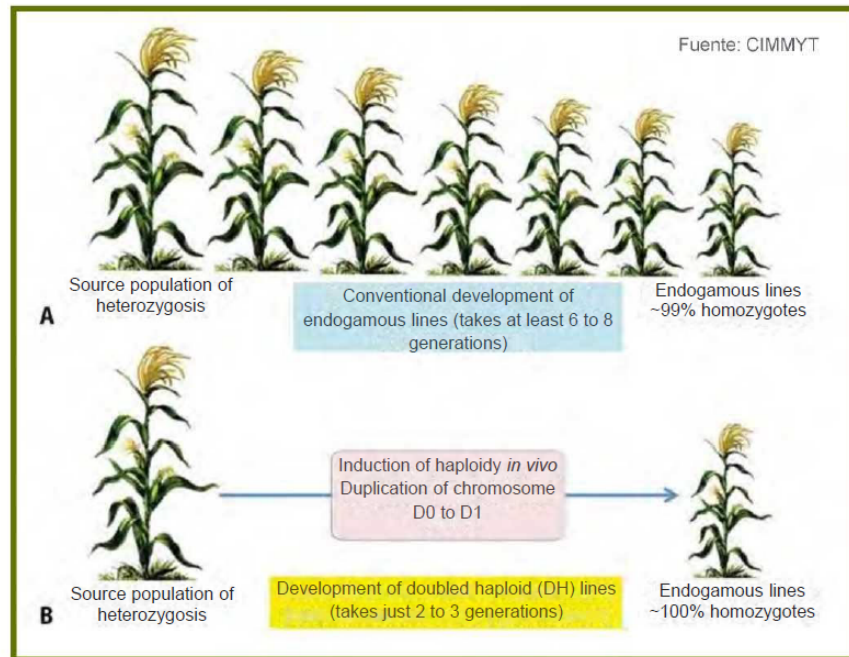


Figure 1: (A) conventional inbreeding; (B) DH technology. D.I. 1-5 at 14.

The '846 patent claims improved methods for producing doubled haploid maize plants. Pioneer explained during prosecution that, compared to previous methods, the claimed methods “decrease[] the time needed to develop a double haploid plant” in multiple ways. D.I. 58-2¹ at PNR_DH_00000300. For example, the claimed methods require the use of maize embryos, rather than later-developed maize tissues such as dry seeds or seedlings. *Id.* (“the contact with the doubling agent occurs at a very early stage of development”); *id.* at PNR_DH_00000407 (“exposure of haploid embryos to chromosome doubling agents occurs at an early stage”). The claimed methods also “do not require the labor intensive process of developing embryogenic callus”—i.e., producing de-differentiated masses of maize cells known as callus tissue—from which to regenerate a maize plant. *Id.* at PNR_DH_00000299. The claimed methods instead proceed in “a streamlined fashion with only a minimum deviation from normal plant

¹ The file history for the '846 patent was previously filed with the parties' Joint Claim Construction Chart as D.I. 58-2.

development.” *Id.* at PNR_DH_00000407 (“This is advantageous in that it is faster and there is no need to develop callus.”).

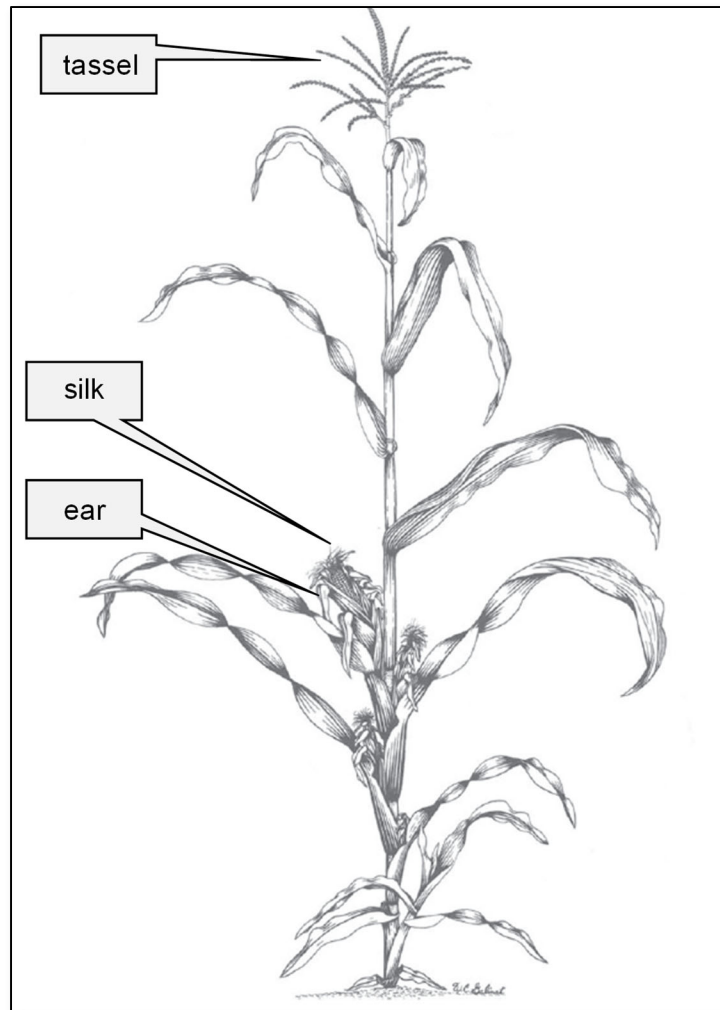
At the conclusion of prosecution of the ’846 patent, the Examiner issued a notice of allowance with an Examiner’s Amendment reflecting the benefits described above. For example, the Examiner amended claim 1 to include part (b), reciting “isolating said haploid maize embryo between 4-21 days.” *Id.* at PNR_DH_00000428. The Examiner also amended claim 1 to include part (d), reciting “culturing said doubled haploid maize embryo cell on a non-callus promoting medium.” *Id.* at PNR_DH_00000429. While moving a “wherein” clause reciting that the at least one haploid maize embryo “is distinguished from the diploid maize embryos *via expression of a marker*,” the Examiner imposed no timing limitation for that clause. *Id.* Rather, the Examiner left dependent claim 5 unamended, which separately adds a timing limitation for marker expression (i.e., “wherein said marker gene is expressed 4 or more days after pollination”). *Id.* at PNR_DH_00000403; *id.* at PNR_DH_00000428-429.

B. Syngenta’s Answering Position

Claim 1, the sole independent claim of the ’846 patent, claims a method of obtaining a doubled haploid maize plant, reciting five separate steps labeled sequentially (a)–(e).

1. A method of obtaining a doubled haploid maize plant, said method comprising:
 - (a) pollinating silks of a maize ear with a maize inducer line to produce at least one diploid maize embryo and at least one haploid maize embryo;
 - (b) isolating said haploid maize embryo between 4-21 days after step (a), wherein said at least one haploid maize embryo is distinguished from the diploid maize embryos via expression of a marker;
 - (c) contacting said haploid maize embryo with a chromosome doubling agent to produce at least one doubled haploid maize embryo cell;
 - (d) culturing said doubled haploid maize embryo cell on a non-callus promoting medium; and
 - (e) generating a doubled haploid maize plant from said doubled haploid maize embryo cell.

Step (a) concerns “pollinating” maize. The maize ear, the female reproductive organ, has silks that emerge from the tips of the husk. Every potential kernel has its own silk. Each silk must be pollinated to develop a kernel. The male reproductive organ—the tassel—is at the top of the maize plant and contains pollen.



Pollination occurs when pollen from a tassel reaches the exposed silks. Following pollination, a fertilized egg develops into a kernel. Inside each kernel is a single embryo. Normal pollination results in a “diploid” embryo—an embryo with two sets of chromosomes ($2n$), one maternal set and one paternal set. ’846, 1:36–38. Normal pollination also can result in embryos having only one set of chromosomes (n) and are thus haploid (*id.*, 1:33–35), but this occurs at a very low frequency. Pollination with a “maize [haploid] inducer line” increases the frequency of haploids. *See id.*, 12:63–64 (5–12%). The maize inducer line provides the pollen for fertilization of the ear and “induces” haploidy in the resulting embryo. *Id.*, 5:29–36.

Step (b) concerns “isolating” the haploid embryos of interest. Because haploid and diploid embryos appear identical, this step also requires a marker gene “to distinguish the haploid embryos from the embryos obtained from normal pollination (2N).” *Id.*, 3:65–67. Once distinguished, typically visually (*id.*, 9:47–48), the embryo is extracted from the maize kernel. *Id.*, 13:21–22. The claim requires this step to occur after the pollination step, “between 4–21 days after step (a),” and was added to overcome the examiner’s rejections. *See* D.I. 58-2, PNR_DH_00000429.

Step (c) is where the single set of chromosomes in the haploid embryo are doubled. This doubling is required to make the embryo viable because the embryo needs two sets of chromosomes to develop into a fertile plant. In this step, the extracted embryo is exposed to a doubling agent (’846, 1:58–65), which is a well-known set of chemicals affecting the way cells divide and results in duplication of chromosomes. The result of exposing the haploid embryo to a doubling agent is, as stated in step (c), a “doubled haploid maize embryo cell.”

Step (d) is “culturing” the resulting “doubled haploid maize embryo cell” from step (c) on a “non-callus promoting medium,” which is defined in the patent as a medium that does not support proliferation of callus. *Id.*, 1:56–57 (callus); 1:66–67 (medium); 8:65–9:23 (non-callus promoting). The patent, however, fails to delineate what is and is not a callus promoting medium. Regardless, the claim does not foreclose callus formation—only that culturing should occur on a non-callus promoting medium. Indeed, the patent explains the “[m]ethods provided may or may not go through a callus formation stage.” *Id.*, 8:65–66; *see* D.I. 58-2, PNR_DH_00000407 (responding to the examiner’s rejections, Pioneer stated “there is no need to develop a callus” but Pioneer did not state that a callus could never develop).

Finally, step (e) requires using the “doubled haploid maize embryo cell” made in in step (c) and cultured in step (d) to generate a “doubled haploid maize plant” using well-known approaches. ’846, 1:39–49, 12:16–17, 24–29.

III. AGREED-UPON CONSTRUCTIONS

The parties have no wholly agreed-upon constructions.

IV. DISPUTED CONSTRUCTIONS

Pioneer’s Position. Courts construe claims as a matter of law, primarily based on the intrinsic evidence—i.e., the patent claims, specification, and prosecution history. *Immunex Corp. v. Sanofi-Aventis U.S. LLC*, 977 F.3d 1212, 1218–22 (Fed. Cir. 2020). Federal Circuit law imposes a “‘heavy presumption’ that claim terms carry their accustomed meaning in the relevant community at the relevant time.” *Home Diagnostics, Inc. v. LifeScan, Inc.*, 381 F.3d 1352, 1355 (Fed. Cir. 2004).

Indefiniteness, which Syngenta raises for some claim terms, is an invalidity defense that requires proof by clear and convincing evidence that a skilled artisan would have been unable to ascertain the meaning and scope of the claims with “reasonable certainty.” *See Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014); *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1365 (Fed. Cir. 2017). Because factual issues regarding “what a skilled artisan knew at the time of the invention [are] pertinent to whether the claims are reasonably clear,” courts disfavor deciding indefiniteness issues during claim construction, when fact and expert discovery remain ongoing. *See, e.g., Dow Chem. Co. v. Nova Chems. Corp.*, 809 F.3d 1223, 1225 (Fed. Cir. 2015) (Moore, J., concurring); *Otsuka Pharm. Co. v. Zenara Pharma Private Ltd.*, C.A. No. 19-1938-LPS, 2021 WL 3172017, *4-5 (D. Del. July 27, 2021) (declining to rule on alleged indefiniteness at the *Markman* stage in view of factual disputes over the understanding of a skilled artisan); *Adapt Pharma Operations Ltd. v. Teva Pharms. USA, Inc.*, C.A. No. 16-7721-JLL, 2019 WL 1789463,

at *4 (D.N.J. Apr. 24, 2019) (similarly declining to address alleged indefiniteness because, *inter alia*, discovery was ongoing).

Here, the claims' meaning would have been clear to a skilled artisan, and thus do not require construction. To the extent the Court believes construction would be helpful to the jury, Pioneer's constructions faithfully adhere to the plain and ordinary meaning of the claims.

Syngenta's Position. The parties dispute several claim terms and the implications thereof. Syngenta's construction, supported by the claim's language, intrinsic evidence, and logic, requires the method's steps to be performed in their written order. In step (b), Syngenta's construction gives proper effect to the "wherein" clause and avoids rewriting the opening clause. In step (c), Syngenta's construction preserves and clarifies the step's anaphoric reference to step (b). In step (e), Syngenta's construction properly incorporates the lexicography of the specification and clarifies the sequential nature of the claim as written. Syngenta's proposed construction for each of the foregoing would give the ordinary and customary meaning to those terms as supported by intrinsic evidence.

Additionally, Syngenta shows that the claim is indefinite due to Pioneer's vague and unhelpful lexicography for the term "non-callus promoting medium" in step (d), and that claim 5 is an invalid dependent claim because it is broader than claim 1.

A. Claim 1(b) Terms

Claim Terms/Phrases	Pioneer's Proposed Construction	Syngenta's Proposed Construction
1. (b) isolating said haploid maize embryo between 4-21 days after step (a), wherein said at least one haploid maize embryo is distinguished from the diploid maize	<i>Not indefinite.</i> <i>No construction needed and should be understood according to its plain and ordinary meaning.</i>	"4-21 days after step (a), extracting the haploid maize embryo from a kernel of the maize ear of step (a) based upon whether the at least one haploid maize embryo has, or has not, expressed a marker gene"

Claim Terms/Phrases	Pioneer’s Proposed Construction	Syngenta’s Proposed Construction
embryos via expression of a marker	<p>Alternatively, Pioneer proposes construing the claim terms/phrases as follows:</p> <p>“Extracting the at least one haploid maize embryo from a kernel of the maize ear between 4-21 days after step (a)”</p> <p>“The expression of a marker gene is used to distinguish the at least one haploid maize embryo from the diploid maize embryos.”</p>	Alternatively, the claim is indefinite.

1. Pioneer’s Opening Position

Courts construe claims as a matter of law, primarily based on the intrinsic evidence—i.e., the patent claims, specification, and prosecution history. *Immunex Corp. v. Sanofi-Aventis U.S. LLC*, 977 F.3d 1212, 1218-22 (Fed. Cir. 2020). Federal Circuit law imposes a “‘heavy presumption’ that claim terms carry their accustomed meaning in the relevant community at the relevant time.” *Home Diagnostics, Inc. v. LifeScan, Inc.*, 381 F.3d 1352, 1355 (Fed. Cir. 2004).

Indefiniteness, which Syngenta raises for some claim terms, is an invalidity defense that requires proof by clear and convincing evidence that a skilled artisan would have been unable to ascertain the meaning and scope of the claims with “reasonable certainty.” *See Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014); *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1365 (Fed. Cir. 2017). Because factual issues regarding “what a skilled artisan knew at the time of the invention [are] pertinent to whether the claims are reasonably clear,” courts disfavor deciding indefiniteness issues during claim construction, when fact and expert discovery remain ongoing. *See, e.g., Dow Chem. Co. v. Nova Chems. Corp.*, 809 F.3d 1223, 1225 (Fed. Cir. 2015) (Moore, J., concurring); *Otsuka Pharm. Co. v. Zenara Pharma Private Ltd.*, C.A. No. 19-1938-

LPS, 2021 WL 3172017, *4-5 (D. Del. July 27, 2021) (declining to rule on alleged indefiniteness at the *Markman* stage in view of factual disputes over the understanding of a skilled artisan); *Adapt Pharma Operations Ltd. v. Teva Pharms. USA, Inc.*, C.A. No. 16-7721-JLL, 2019 WL 1789463, at *4 (D.N.J. Apr. 24, 2019) (similarly declining to address alleged indefiniteness because, *inter alia*, discovery was ongoing).

Here, the claims’ meaning would have been clear to a skilled artisan, and thus do not require construction. To the extent the Court believes construction would be helpful to the jury, Pioneer’s constructions faithfully adhere to the plain and ordinary meaning of the claims.

a. Claim 1, Part (b) Requires No Construction

The terms in part (b) of claim 1 require no construction because their plain and ordinary meaning is clear. Claim 1 requires “isolating” a haploid maize embryo. The specification explains that isolating refers to physical removal of the haploid maize embryo from a maize kernel. *E.g.*, D.I. 58-1 at 13:21-22. It also distinguishes isolated embryos from those within a kernel. *E.g.*, *id.* at 4:5-9 (“the haploid embryo... may be isolated, may be in the... kernel, may be in the kernel on a slice of cob... or the haploid embryo may be in the kernel which is on the ear and on the plant”); *id.* at 6:12-13 (distinguishing an “isolated” haploid embryo from one that “may be contained within the kernel”); *id.* at 7:61-63. Claim 1 further requires isolating the haploid maize embryo “between 4-21 days” after pollinating the silks of a maize ear in part (a), which is a straightforward time limitation for a skilled artisan to understand.

The “wherein” clause in part (b) of claim 1 has separate requirements. It requires “expression of a marker” and uses passive voice (rather than requiring action) in reciting that the haploid maize embryo “is distinguished via expression of a marker” from the diploid maize embryos. The wherein clause contains no time limitation. Thus, with the open “comprising” language of claim 1, the timing of marker expression and distinguishing are not tied to the time

limitation specified for the act of “isolating.” Indeed, dependent claim 5 separately adds a time limitation for expression of the marker—i.e., “4 or more days after pollination”—which shows that no timing requirement for marker expression is present in the “wherein” clause of claim 1. *Phillips*, 415 F.3d at 1314-1315 (“[T]he presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation is not present in the independent claim.”). In addition to this straightforward claim differentiation, the specification describes a variety of different marker genes that a skilled artisan would have understood express at different times, as well as a range of preferred times for marker expression that overlaps with—but differs from—the 4-21 day requirement for “isolating” in claim 1. D.I. 58-1 at 9:47-10:57 (“In particular, it may be desirable to express the marker gene... about 10 hours-15 days after pollination.”).

Syngenta’s proposed construction, in contrast, improperly reads extraneous features into claim 1 and should be rejected. For example, Syngenta’s construction contains a new requirement that the haploid maize embryo must be extracted “based on” the previous expression of a marker gene. Claim 1, however, does not contain a timing limitation requiring the marker gene to have expressed before isolation. Claim 1 also nowhere prohibits extracting *all maize embryos* on a cob (i.e., extracting both the diploid and haploid maize embryos), rather than isolating only the haploid embryos based on marker expression. Nor does claim 1 require excluding or discarding diploid maize embryos. Thus, Syngenta’s new “based on” limitation is unsupported and unduly narrow.

Contradicting the plain language of claim 1, Syngenta’s construction also incorrectly seeks to apply the 4-21 day limitation to all requirements of claim 1, part (b). *Interactive Gift Exp., Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001) (“[i]n construing claims, the analytical focus must begin and remain centered on the language of the claims themselves”); *Home Diagnostics*, 381 F.3d at 1355 (“As always, the claim language itself governs the meaning of the

claim.”); *Phillips*, 415 F.3d at 1312-13. It further ignores dependent claim 5’s separate recitation of a timeframe for marker expression, which confirms that claim 1, part (b) does not contain any such timing limitation, let alone require the *active use* of such marker expression as a prerequisite for “isolating” haploid maize embryos, as Syngenta’s “based on” construction requires.² Syngenta’s construction also contradicts embodiments of the specification where embryos may be isolated without regard to whether a marker gene has expressed or whether the embryos have yet been identified as haploid or diploid. *E.g.*, D.I. 58-1 at 7:60-63; 13:46-54, 14:20-28; *Hyperphrase Tech., LLC v. Google, Inc.*, 260 Fed. Appx. 274, 280 (Fed. Cir. 2007) (“A claim construction that excludes an embodiment of the relevant claim(s) is typically incorrect.”).

Because a skilled artisan would have understood the straightforward language of part (b) of claim 1, no construction is necessary. Nevertheless, should the Court believe that the jury would benefit from a construction, Pioneer’s plain and ordinary meaning construction is well supported by the intrinsic evidence.

b. The Part (b) Terms Are Not Indefinite

Syngenta cannot establish by clear and convincing evidence that the part (b) terms are indefinite. *See BASF*, 875 F.3d at 1365. During the parties’ May 23, 2023 meet and confer, Syngenta asserted that the claim is indefinite based on a purported lack of antecedent basis relating to the “haploid maize embryo” terms. Syngenta’s position is incorrect. Here, part (a) of claim 1 references “at least one haploid maize embryo.” A skilled artisan would have reasonably understood part (b) because “said” haploid maize embryo refers back to the “at least one haploid maize embryo” from part (a). Pioneer’s alternative construction similarly refers back to the “at

² Disregarding this straightforward application of the principle of claim differentiation, Syngenta contends that claim 5 is somehow *broadier* than claim 1 and invalid as an improper dependent claim, which is incorrect as discussed below in § IV.F.1.

least one haploid maize embryo” language of part (a). Accordingly, claim 1 is not indefinite because a purported lack of an antecedent basis cannot render a claim indefinite where the claim appraises a skilled artisan of its scope, as claim 1 does here. *See Energizer Holdings, Inc. v. Int’l Trade Comm’n*, 435 F.3d 1366, 1370 (Fed. Cir. 2006) (reversing indefiniteness and explaining that antecedent basis “must be decided in context”).

2. Syngenta’s Answering Position

The parties appear to have three areas of agreement with respect to the proper construction of step (b). The parties agree that “marker” in the wherein clause refers to a “marker gene” that may be expressed by either haploid or diploid embryos. *See supra*, § IV.A.1. The parties agree that “isolating” in the opening clause means “extracting a haploid maize embryo from a kernel of the maize ear of step (a),” and that such extraction must occur between “4–21 days after step (a).” *Id.* Finally, the parties agree that there are two clauses in claim 1, step (b): the opening clause, “isolating said haploid maize embryo between 4–21 days after step (a),” and the wherein clause, “wherein said at least one haploid maize embryo is distinguished from the diploid maize embryos via expression of a marker.” *See id.*

The parties dispute the meaning of step (b)’s “wherein” clause. Syngenta proposes a construction in which step (b)’s “wherein” clause informs the requirements of the opening clause of step (b), consistent with the grammar of the claim and the location of the clause within the claim. Pioneer ignores this context by proposing no construction is needed; but alternatively proposes rewriting the claim to improperly expand its scope by severing step (b)’s clauses into two distinct steps, thereby excluding the “wherein” clause from the 4–21 day time limitation of the “isolating” clause.

The parties also dispute the meaning of “said haploid maize embryo” in the opening clause. Syngenta’s construction would stay true to the claim’s wording and leave the phrase intact; Pioneer would rewrite the phrase as “said at least one haploid maize embryo.”

a. Step (b)’s “wherein” clause modifies and limits the immediately preceding “isolating” clause

First, the plain language of claim 1(b) supports Syngenta’s proposed construction because it accurately reflects the relationship between step (b)’s “isolating” and the “wherein” clause that follows. A “wherein” clause that follows a step in a method limits the scope of that step. *Endo Pharms. Inc. v. Teva Pharms. USA, Inc.*, 919 F.3d 1347, 1355 (Fed. Cir. 2019) (“The wherein clause that immediately follows the orally administering step limits the scope of the orally administering step.”); *Griffin v. Bertina*, 285 F.3d 1029, 1033 (Fed. Cir. 2002) (“the [PTAB] did not err in giving limiting effect to the ‘wherein’ clauses because they relate back to and clarify what is required by the count.”).

Here, the opening clause of step (b) recites “isolating” a haploid embryo between 4–21 days after step (a). This is immediately followed by the “wherein” clause, which clarifies what is required to isolate haploid embryos: one must have distinguished haploid embryos from diploid embryos via (i.e., based on) the expression of a marker gene. *See Griffin*, 285 F.3d at 1033 (wherein clauses “relate back to and clarify what is required” by the claim step). Indeed, the marker gene can be “[s]electable, scorable, negative, [or] positive...and come through the female or male plant.” ’846, 10:54–56. But in any case, haploid and diploid embryos are distinguished based upon the expression of a marker gene. *Id.* Because embryos are distinguished based upon the expression of a marker gene, and because step (b) recites isolating only haploid maize embryos, logic requires that the haploid embryos are extracted “based upon whether the at least one haploid maize embryo has, or has not, expressed a marker gene,” i.e., the “wherein” clause serves as a limitation on the

“isolating” clause. *See* D.I. 58-2, PNR_DH_00000332 (arguing to the examiner that distinguishing between haploids and diploids increases efficiency because “diploid embryos can be discarded at an early stage”).

As in *Griffin*, the “wherein” clause here clarifies that the process of distinguishing between haploid and diploid embryos is a necessary part of isolating a haploid embryo. *See* 285 F.3d at 1033. Under the language of the claim, neither the expression of marker genes nor the haploid embryos being distinguished from diploid embryos can occur outside of the 4–21 day time limitation required in step (b). Nothing in step (b) contradicts this construction. If the claim contemplated that marker gene expression and embryo “distinguishing” could occur outside of the 4–21 day period of step (b), the patentee could have drafted the claim accordingly. Instead, the claim places both clauses within the same step, separated only by a comma. The claim does not expressly state that the second clause is free from the time limitation of the first clause. Nor does the claim separate the clauses with spacing or punctuation that would indicate their independence. *Cf. In re Affinity*, 856 F.3d at 907 (discussing semi-colons and stating “[t]his punctuation choice strongly indicates that each step is separate and distinct”).

Second, the specification indicates the “isolating” and “wherein” clauses go hand-in-hand. The ’846 patent discloses isolating immature haploid embryos between 4–21 days after pollination by distinguishing the embryos expressing a color marker. ’846, 10:45–61 (“For various reasons it may be desirable to express the marker gene in the embryo. In particular, it may be desirable to express the marker gene in the early stage of development.... Haploid embryos can then be

distinguished from the normally pollinated embryos because the haploid embryos will not contain the marker gene.”).³

Thus, it is no surprise that the embodiments in the patent disclose isolating haploid embryos “based on the identification of the visible marker gene in the inducer lines.” *Id.*, 13:1–3(Example 1); *see also* 13:46–53(Example 2) (“Immature embryos were isolated at 12 days after pollination....The diploid embryos, GFP expressing embryos, were discarded. The haploid embryos, based on the absence of the GFP marker expression, were cultured on a medium comprising...colchicine....”); 14:22–28(Example 3) (“Immature embryos were isolated at 11 days after pollination....The diploid embryos, embryos showing GFP expression, were discarded. The haploid embryos, embryos not expressing GFP, were cultured on...pronamide....”).

Third, the prosecution history requires that the “wherein” clause attach to the “isolating” step. Pioneer’s arguments during prosecution foreclose its proposed construction allowing for embryo isolation regardless of ploidy. Responding to an office action rejecting claim 1 as obvious, Pioneer added the “wherein” clause, arguing non-obviousness because the prior art allegedly does not teach “identifying haploid embryos from diploid embryos at an early stage of maturity.” D.I. 58-2, PNR_DH_00000330–32. Pioneer explained that identifying haploid embryos at an early

³ *See also id.*, 2:10–11 (“Provided are methods for [] identifying haploid embryos at an early stage with high accuracy”); 2:25–26 (“the inducer line has a marker gene that is expressed in embryos and/or endosperm tissue”); 2:26–30 (“b) selecting a haploid embryo which does not express a marker gene; c) contacting the haploid embryo with...a doubling agent; and d) regenerating that embryo into a doubled haploid plant.”); 3:65–67 (“In any of these methods markers may be used...to distinguish the haploid embryos from the embryos obtained from normal pollination (2N).”); 4:5–6 (“In any of these methods the haploid embryo that undergoes chromosomal doubling may be isolated”); 6:12 (“The haploid embryo may be isolated.”); 9:47–61 (“A scorable marker gene can be used in the methods, for example colored markers in the endosperm or embryo may be utilized” and listing markers that express in the endosperm or embryo); 10:23–24 (“To be useful in haploid/diploid screening, an allele must confer color in both the endosperm (aleurone) and embryo.”).

stage is important: “Distinguishing between haploids and diploids...increases the efficiency of producing double haploids in a breeding program” and “Distinguishing a haploid or double haploid embryo from a diploid embryo decreases the man hours and equipment needed for such items as embryo transfers, transplanting, and space can be substantially decreased.” *Id.*, PNR_DH_00000332. The Examiner’s Amendment that resulted in allowance of claim 1 is dispositive of the claim construction issue—because of Pioneer’s arguments, the Examiner moved Pioneer’s “wherein” clause, detached from a step at the end of the claim, to a newly drafted “isolating” step. *Id.*, PNR_DH_00000428. Thus, Pioneer’s proposed claim construction should be rejected because it effectively creates a new step of “distinguishing” that is not attached to “isolating,” negating the very reason the claim was allowed by the Patent Office.

b. Pioneer’s approach to construing Step (b) is wrong.

Pioneer’s proposed construction is wrong for at least four reasons. *First*, it improperly severs step (b)’s two clauses, attempting to broaden the scope of the claim. Pioneer argues that “distinguishing” is a separate step from “isolating,” and that “the timing of marker expression and distinguishing are not tied to the time limitation specified for the act of ‘isolating,’” because, when read separately, “[t]he wherein clause contains no time limitation.” *Supra*, § IV.A.1. That, however, ignores the express language of the claim, in which the patentee chose to claim “isolating,” and chose to modify isolating with a “wherein” clause attached to that “isolating” step instead of claiming a separate “distinguishing” step.

Second, Pioneer argues that step (b) “does not contain a limitation requiring the marker gene to have expressed before isolation.” *Supra*, § IV.A.1. This ignores the plain language and grammar of step (b). Indeed, Claim 1(b)’s use of the present tense in the opening clause (i.e., “isolat~~ing~~”) and past participle in the wherein clause (i.e., “distinguish~~ed~~”) supports Syngenta’s construction. “Distinguished” is the past participle of “distinguish.” Ex. 3, (Merriam-Webster, 11th

Ed. 2005). A past participle expresses completed action. *Id.* Consistent with these rules of grammar, past participle use in a claim limitation signals the action was already completed. *Tuna Processors, Inc. v. Hawaii Int'l Seafood, Inc.*, 327 F. App'x 204, 209 (Fed. Cir. 2009) (use of past participle in “produced smoke” refers to smoke that was produced in an earlier step of the method); *Donghee Am., Inc. v. Plastic Omnium Advanced Innovation & Rsch.*, 812 F. App'x 988, 991 (Fed. Cir. 2020) (“the term ‘stake-fastened’” is “the past participle of ‘stake-fasten,’” “refer(s) to what has already occurred,” and “describes an accessory that has already been fastened to the tank wall”); *CellTrust Corp. v. ionLake, LLC*, No. 19-cv-2855, 2022 U.S. Dist. LEXIS 158764, *28 (D. Minn. Sept. 2, 2022) (“A past participle...typically expresses completed action”); *Classen Immunotherapies, Inc. v. Idec*, 968 F. Supp. 2d 660, 683 (D. Md. 2013) (“The use of the past participle ‘screened’ requires that the screening already has been done at the time of immunization.”). Here, the use of the past participle “distinguished” in the wherein clause means that by the time one is actively “isolating” haploid embryos, one has already completed the process of distinguishing between haploid and diploid embryos. This grammatical rule of claim construction requires that the distinguishing of haploid embryos from diploid embryos, and therefore the expression of marker genes, must occur before “isolating” is complete, i.e., before the 4–21 day period elapses. Stated differently, in the isolating step, the haploid or diploid already has expressed a marker gene allowing one to distinguish between the two so that only the haploid maize embryos, the embryos of interest, are extracted for use in the next step (step (c)).

Third, Pioneer argues that claim 1 “nowhere prohibits extracting *all maize embryos* on a cob (i.e., extracting both the diploid and haploid maize embryos), rather than isolating only the haploid embryos based on marker expression.” *Supra*, § IV.A.1. As an initial matter, no such embodiment is described in the patent. However, unlike the process by which embryos are

“distinguished,” which references both haploid and diploid embryos, the “isolating” process references *only* haploid embryos. The patentee’s intentional exclusion of diploid embryos from the “isolating” clause is obvious given that haploid and diploid embryos are both referenced in the wherein clause’s distinguishing process. Furthermore, isolating only haploid embryos aligns with the purpose of the purported invention, which is efficiency. ’846, 1:25–29 (“The methods presented increase the *efficiency* of the doubled haploid process...by decreasing the amount of time required to produce the doubled haploids.”); D.I. 58-2, PNR_DH_00000332 (“If the diploid embryos can be discarded at an early stage man hours and equipment needed for such items as embryo transfers, transplanting, and space can be substantially decreased.”).

Fourth, in contrast to the ample support for Syngenta’s proposed construction, the specification does not support Pioneer’s proposed construction. Pioneer does not and cannot cite the specification to support that distinguishing haploid from diploid embryos is separate from isolating haploid from diploid embryos. Pioneer cannot cite the specification for the simple reason that no such disclosure exists in the ’846 patent.

For the foregoing reasons, the process of isolating (extracting) haploid embryos requires that haploid embryos are “distinguished via expression of a marker gene” before they are extracted, and the entire process must occur “between 4–21 days after step (a).” Syngenta’s construction aligns with the plain and ordinary meaning, accurately reflecting the relationship between the clauses of step (b); Pioneer’s construction does not.

c. Antecedents in the claims supports Syngenta’s construction.

Syngenta’s proposed construction would not disturb the anaphoric phrase “said haploid maize embryo” in the opening clause of step (b).⁴ Conversely, Pioneer rewrites the term into “the

⁴ Although Syngenta proposes switching the definite article “said” to “the,” there is no legal or grammatical distinction between “said” or “the” in this context. *Wi-Lan, Inc. v. Apple, Inc.*, 811

at least one haploid maize embryo.” This modification, however, is an attempt by Pioneer to eliminate the sequential nature of steps (b) and (c).

As discussed above, step (b) consists of two sub-parts occurring in conjunction with one another. First, the “said at least one haploid maize embryo is distinguished from the diploid maize embryos via expression of a marker.” Based on that distinction, one isolates the “said haploid maize embryo.” As written, step (b), within the same sentence, contains two versions of the anaphoric references to a haploid maize embryo: “said at least one haploid maize embryo” and “said haploid maize embryo.” In drafting claim 1, the patentees chose two distinct phrases to refer to the haploid maize embryo to be distinguished and the haploid maize embryo to be isolated. “Different claim terms are presumed to have different meanings.” *Bd. of Regents v. BENQ Am. Corp.*, 533 F.3d 1362, 1371 (Fed. Cir. 2008). If the patentees wanted to use the same phrase to refer to both the haploid maize embryo to be distinguished and the haploid maize embryo to be isolated, they would have done so. They did not. Additionally, the difference in meanings becomes apparent when reading step (c), which discusses “contacting *said haploid maize embryo* with a chromosome doubling agent.” Step (c) directly invokes the antecedent introduced in the opening phrase of step (b) (the haploid embryo that was isolated) as opposed to the phrase in the “wherein” clause (the haploid embryo that was distinguished from diploid embryos).

Construction requiring an order of steps is proper “when the claim language, as a matter of logic or grammar, requires that the steps be performed in the order written, or the specification directly or implicitly requires” an order of steps. *Mformation*, 764 F.3d at 1398–1400. Here, because step (c) directly invokes the antecedent introduced in step (b), and does *not* invoke the

F.3d 455, 462 (Fed. Cir. 2016) (“Subsequent use of the definite articles ‘the’ or ‘said’ in a claim refers back to the same term recited earlier in the claim.”).

antecedent introduced in step (a), it is apparent from the language of the claim that step (c) follows step (b). Pioneer’s proposed construction switches “said haploid maize embryo” to a different claim term—“the at least one haploid maize embryo,” thereby changing the meaning, and scope, of the claims allowed by the Patent Office.

For the reasons outlined above, Syngenta’s proposed construction reflects the plain and ordinary meaning of claim 1, step (b) and should be adopted by the Court.

3. Pioneer’s Reply Position

Pioneer’s plain and ordinary meaning construction of claim 1, part (b) should be adopted. It is consistent with the claim language in declining to apply the 4-21 day time period for the “isolating” limitation to a different limitation, i.e., “is distinguished... via expression of a marker.” It is also consistent with claim differentiation—claim 5 separately recites a different time period for the marker expression in the wherein clause of claim 1. It is further consistent with the specification and file history, which refer to the distinguishing and marker expression requirements of the wherein clause as different than isolating (i.e., extracting) embryos from kernels.

Syngenta’s construction, in contrast, is unduly narrow and violates numerous principles of claim construction. Accordingly, as detailed below, Syngenta’s proposed construction should be rejected in favor of Pioneer’s.

a. Syngenta’s Construction Disregards Claim Differentiation and Contradicts the Plain Claim Language

Syngenta fails to address the most compelling intrinsic evidence regarding the “wherein” clause of claim 1, part (b)—the plain claim language and the straightforward application of claim differentiation. *Kaneka*, 790 F.3d at 1304 (claim construction begins with the claim language itself).

It is undisputed that the wherein clause—i.e., “is distinguished. . . via expression of a marker”—itself recites no express time limitation. It is also undisputed that dependent claim 5 separately claims a time limitation for marker expression (i.e., “four or more days after pollination”), which creates a strong presumption that no time limitation is present in the wherein clause of claim 1. *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1317 (Fed. Cir. 2014) (claim differentiation is “at its strongest” when a limitation sought to be read into an independent claim already appears in a dependent claim); *Phillips*, 415 F.3d at 1314-15. Syngenta’s answering brief ignored Pioneer’s arguments based on the differing scope of claim 1 and dependent claim 5 and therefore failed to overcome the strong presumption of claim differentiation that weighs heavily against Syngenta’s construction.

As the Federal Circuit has held, overcoming claim differentiation requires “strong contrary evidence” such as (i) clear disavowal of claim scope or (ii) definitional language in the patent. *InterDigital Commc’ns v. Int’l Trade Comm’n*, 690 F.3d 1318, 1324 (Fed. Cir. 2012). Syngenta provided no such evidence, nor could it. There was no clear disavowal of claim scope during prosecution because the Examiner’s amendment left dependent claim 5 intact and added no time limitation to the wherein clause of claim 1. D.I. 58-2 at PNR_DH_00000403, PNR_DH_00000428-29. There is also no limiting definitional language in the specification—the specification describes a different preferred range for marker expression (10 hours to 15 days after pollination) that is not tied to the 4-21 day period for “isolating” in claim 1. D.I. 58-1 at 9:47-10:57. The un rebutted presumption of claim differentiation alone demonstrates that Syngenta’s construction is incorrect.

Syngenta’s construction is also incorrect because it renders claim 5 superfluous, another strongly disfavored outcome. *InterDigital*, 690 F.3d at 1325 (a construction that “renders claim 5

superfluous [is] a result that counsels strongly against that construction”). Here, by Syngenta’s own admission, claim 5 would have no effect if its construction is adopted. Syngenta’s construction goes even further by proposing rendering claim 5 invalid as allegedly broader than claim 1, yet another disfavored outcome. *Wang Labs., Inc. v. Am. Online, Inc.*, 197 F.3d 1377, 1383 (Fed. Cir. 1999) (“[C]laims are not properly construed to have a meaning or scope that would lead to their invalidity”). The Federal Circuit has held that numerical ranges appearing in a dependent claim *must* be within the scope of the independent claim from which it depends, rather than construing the independent claim as *narrower* than a dependent claim. *See, e.g., Alcon Rsch., Ltd. v. Apotex Inc.*, 687 F.3d 1362, 1368 (Fed. Cir. 2012) (when a dependent claim “sets forth a range, that range at a minimum must be included in claim 1”). Syngenta provides no evidence justifying a different outcome here.

Disregarding claim differentiation and the plain claim language, Syngenta places undue emphasis on the location of the wherein clause in seeking to limit it to the 4-21 day period for “isolating.” Syngenta relies on *Endo*, however, where the claim had a wherein clause that *repeated the same verb* as the preceding clause, thus modifying that previous action. *Endo Pharms., Inc. v. Teva Pharms. USA, Inc.*, 919 F.3d 1347, 1351, 1355 (Fed. Cir. 2019). Here, as shown below in red and black italics, the wherein clause uses a *different, passive-voice verb* (i.e., “is distinguished . . . via expression of a marker”) as compared to the active verb in the preceding clause (“isolating”). Moreover, unlike in *Endo*, a *second* wherein clause in claim 5 of the ’846 patent provides the time limitation for marker expression.⁵

⁵ *Griffin* also fails to support Syngenta’s position. In that case, the court merely considered whether two wherein clauses were limitations. *Griffin v. Bertina*, 285 F.3d 1029, 1031, 1033 (Fed. Cir. 2002). Moreover, both wherein clauses described the *results* of a detected point mutation (e.g., increased risk of thrombosis or decrease in the degree of inactivation), rather than explaining how to carry out a step of the method in the interference count.

'846 Patent, Claims 1 and 5	Claim 1 in <i>Endo v. Teva</i>
<p>1. (b) isolating said haploid maize embryo between 4-21 days after step (a),</p> <p>wherein said at least one haploid maize embryo is distinguished from the diploid maize embryos via expression of a marker;</p> <p>5. ...wherein said marker gene is expressed 4 or more days after pollination.</p>	<p>1. (c) orally administering to said patient, in dependence on which creatinine clearance rate is found, a lower dosage of the dosage form to provide pain relief;</p> <p>wherein after said administration to said patient, the average AUC of oxymorphone over a 12-hour period is less than about 21 ng·hr/mL</p>

As Syngenta stated in its answering brief, “[i]f the claim contemplated that **marker gene expression** and embryo ‘distinguishing’ could occur outside of the 4-21 day period of step (b), the patentee could have drafted the claim accordingly.” *Supra*, § IV.A.2. As shown above, that is exactly what Pioneer did, separately reciting a time period for marker gene expression in claim 5. The Court should reject Pioneer’s construction because it ignores claim differentiation and would render claim 5 meaningless.

b. Syngenta’s Construction Contradicts the Specification, Excluding Preferred Embodiments

Syngenta’s proposed construction is also incorrect because it is inconsistent with the ’846 patent specification. *Phillips*, 415 F.3d at 1315 (the specification “is always highly relevant to the claim construction analysis”). Here, Syngenta commits a cardinal sin of claim construction by excluding preferred embodiments of the specification, including Examples 2 and 3. *Accent Packaging, Inc. v. Leggett & Platt, Inc.*, 707 F.3d 1318, 1326 (Fed. Cir. 2013) (a construction excluding a preferred embodiment “is rarely, if ever, correct”).

Syngenta incorrectly reads Examples 2 and 3 to require distinguishing haploid embryos *before* one has isolated (i.e., extracted) them. As Dr. Moose explains, however, a skilled artisan

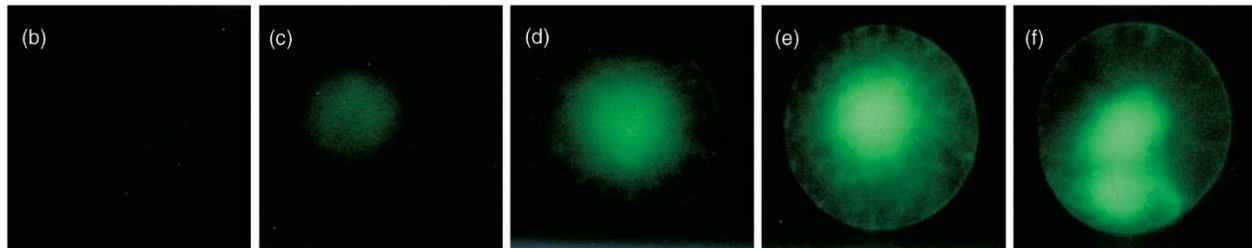
would understand Examples 2 and 3 to disclose the opposite: i.e., that embryos are *first extracted*, and then the haploid and diploid embryos *are distinguished afterwards*. Ex. 4, ¶¶ 21-26.

- Example 2: “Immature embryos [*note: no restriction as to haploids or diploids*] **were isolated** at 12 days after pollination and the embryo size is ranged from 1.9-2.0 mm long. The diploid embryos, **GFP expressing** embryos, were discarded. The haploid embryos, based on the absence of GFP marker expression, were cultured....” D.I. 58-1 at 13:46-54.
- Example 3: “Immature embryos [*note: no restriction as to haploids or diploids*] **were isolated** at 11 days after pollination and the embryo size ranged from 1.5-1.6 mm in length. The diploid embryos, embryos **showing GFP expression**, were discarded. The haploid embryos, embryos not expressing GFP, were cultured. . . .” *Id.* at 14:22-28.

Thus, both Examples 2 and 3 confirm that the embryos were extracted before the GFP marker was detected. Therefore, the maize embryos cannot have been extracted “based upon” the presence or absence of marker expression as Syngenta’s construction requires. Syngenta’s construction would therefore improperly exclude Examples 2 and 3. *Accent Packaging*, 707 F.3d at 1326.

Moreover, as Dr. Moose explains, Syngenta’s reading of Examples 2 and 3 is contrary to how a skilled artisan would have understood the GFP marker used in these examples. A skilled artisan would have understood that detecting expression of GFP—**G**reen **F**luorescent **P**rotein—generally cannot occur under ambient conditions. Ex. 4, ¶¶ 27-30. Thus, a skilled artisan in the act of extracting embryos from kernels in Examples 2 and 3 would not have been able to tell which embryos were expressing GFP and which were not. To detect GFP in maize embryos, skilled artisans would have required special equipment, such as a fluorescence microscope, through which

to view the previously extracted embryos, which is consistent with the procedure described Examples 2 and 3:



Ex. 4, ¶¶ 15, 26-27, Appx. F at 225 (time-lapse figure of GFP expression in a maize fertilized cell using fluorescence microscopy).

Accordingly, Syngenta is incorrect in contending that (i) no embodiment describes isolation of *both* haploid and diploid embryos and (ii) distinguishing haploid from diploid embryos cannot occur separately from isolating them. *See supra*, § IV.A.2. On both points, Examples 2 and 3 describe those features. Syngenta also overlooks the '846 patent's disclosures in column 7, which further describe isolating maize embryos and *immediately* initiating chromosome doubling without first distinguishing haploids from diploids, illustrating that distinguishing can occur at a later time, as Pioneer's construction properly permits. D.I. 58-1 at 7:59-62.

c. Syngenta's Construction Is Inconsistent with the Prosecution History

Syngenta's construction is additionally incorrect because it contradicts the prosecution history. *Phillips*, 415 F.3d at 1315.

Despite contending that the '846 patent was allowed due to allegedly attaching the "is distinguished" limitation to "isolating," Syngenta overlooks the notice of allowance itself and the events leading to it. *Supra*, § IV.A.2. For example, the notice of allowance contains *multiple* amendments, including adding part (d) ("culturing said haploid maize embryo cell on a non-callus promoting medium"), which Syngenta never addresses. D.I. 58-2 at PNR_DH_00000429. The

notice of allowance also notably omits any amendment to dependent claim 5 and its separately claimed time period for marker expression, which Syngenta also never addresses. Syngenta also fails to address the Examiner's stated reasons for allowance, which nowhere refer to the "is distinguished. . . via expression of a marker" feature of the wherein clause:

[T]he prior art fails to teach or reasonably suggest the *period of time between pollination and generation of the doubled haploid maize plant. This period of time is short*, compared to what is taught or suggested in the prior art, due to the treatment of isolated immature maize embryos with a chromosome doubling agent.

Id.

Pioneer explained during prosecution that the claimed methods decreased the time needed to develop a doubled haploid plant. *See supra*, § I.A.; D.I. 58-2 at PNR_DH_00000407. This advantage was a result of factors such as contacting immature maize embryos, rather than later-developed maize tissues such as dry seeds or seedlings, to chromosome doubling agents and omitting the need for producing callus tissue. *See Supra*, § I.A.; D.I. 58-2 at PNR_DH_00000407. These time savings would occur regardless of when embryos are distinguished. As Dr. Moose explains, the overall timeline of developing doubled haploid maize plants from haploid maize embryos remains the same regardless of whether the haploids are distinguished before, during, or after chromosome doubling. Ex. 4, ¶ 30; D.I. 58-2 at PNR_DH_00000332. The prosecution history, thus, does not support narrowing the claims to require completion of marker expression and distinguishing before part (c) of claim 1.

d. Syngenta's Past Participle Argument Is Incorrect

Syngenta's argument that the "distinguished" term is a past participle indicating "completed action" is also incorrect. *Supra*, § IV.A.2. First, Syngenta's past-tense arguments are based on improperly cropping the present-tense helping verb from the claim language "is distinguished. . . via expression of a marker." Second, the "is distinguished" language is passive

voice, and thus does not require any “action,” contrary to Syngenta’s position. Indeed, claim 1 contains no discarding step and does not require taking any action once a haploid maize embryo “*is distinguished*” from a diploid embryo. Moreover, Examples 2 and 3 tie marker expression to contacting with the doubling agent—not embryo isolation—illustrating overlap in parts (b) and (c) of claim 1. D.I. 58-1 at 13:46-54 (“The haploid embryos, based on the absence of the GFP marker expression, were cultured on a medium comprising . . . colchicine”), 14:22-28; Ex. 4, ¶¶ 23-26.

Syngenta’s cited cases are inapposite. None of *Tuna Processors*, *Donghee*, *Celltrust*, or *Classen* involved a present-tense, passive-voice limitation like the “*is distinguished*” language in claim 1 of the ’846 patent. Rather, these cases involved past participle claim language *lacking* any helping verb as in claim 1 here. *Tuna Processors*, 327 F. Appx. at 209 (“produced smoke”); *Donghee*, 812 F. Appx at 991 (“stake-fastened”); *CellTrust*, 625 F. Supp. 3d at 835 (“configured”); *Classen*, 968 F. Supp. 2d at 683 (“screened”).

Moreover, the courts in these cases did not rest their constructions on the claims’ past-participle language alone—they looked to the specification to determine whether a particular order of steps was truly required. *See Tuna Processors*, 327 F. Appx. at 209 (“Nothing in the specification dissuades us” from reading in an order of steps); *Donghee*, 812 F. Appx at 991 (the specification “does not show an embodiment. . . in which stake-fastening has not occurred upon closing the tank”). Here, unlike in Syngenta’s cited cases, the ’846 patent specification repeatedly describes embodiments contradicting Syngenta’s proposed construction, including embodiments where maize embryos are isolated (i.e., extracted from kernels) without distinguishing between the haploid and diploid embryos beforehand, including in Examples 2 and 3. D.I. 58-1 at 7:59-62, 13:46-54, 14:22-28; *Phillips*, 415 F.3d at 1315 (the specification is “always highly relevant” and

“the single best guide” in claim construction); *Accent Packaging*, 707 F.3d at 1326 (a construction excluding a preferred embodiment “is rarely, if ever, correct”).

e. Syngenta’s Antecedent Basis and Order-of-Steps Arguments Are Incorrect

Syngenta’s remaining arguments relying on antecedent terms and seeking to impose a rigid order of steps fare no better than its previous arguments and also should be rejected.

Contrary to Syngenta’s position, the part (b) recitations of “said” and “said at least one” do not require distinguishing embryos before extracting them, which conflicts with Examples 2 and 3 as detailed above. *Supra*, § IV.A.2. Indeed, the mere recitation of antecedent terms does not require that a preceding claim step must be completed before the next. *Cybersettle, Inc. v. Nat’l Arbitration Forum, Inc.*, 243 Fed. Appx. 603, 609 (Fed. Cir. 2007) (finding claim steps with antecedent basis from a previous step could occur “concurrently” and did not require that prior steps “must be completed” before later-recited steps); *Kaneka*, 790 F.3d at 1306-07 (similar).⁶

Syngenta’s attempt to construe part (b) within an overall, rigid order of steps for claim 1 is also incorrect. *Supra*, § IV.E. *Interactive Gift Exp., Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1342 (Fed. Cir. 2001) (claim steps “are not ordinarily construed to require” a particular order). The only part of claim 1 that requires an order is the “isolating” clause of part (b), which expressly refers to “4-21 days *after step (a)*.” The remaining parts of claim 1 contain no such reference back, and thus are open to overlap, particularly with the open-ended “comprising” language of claim 1. *See, e.g., Kaneka*, 790 F.3d at 1306. The broad “comprising” language of the preamble thus allows isolation of both haploid and diploid embryos in part (b), as well as contacting both haploid and diploid embryos with a chromosome doubling agent in part (c).

⁶ Pioneer’s construction appropriately carries through the “at least one” language from part (a), confirming that the claimed method may be carried out on one or more haploid maize embryos.

Syngenta's rigid order-of-steps argument is also foreclosed by the specification. *Phillips*, 415 F.3d at 1315 (“Usually, [the specification] is dispositive; it is the single best guide....”). Examples 2 and 3 confirm that embryo extraction may occur before distinguishing between haploid and diploid embryos in part (b) of claim 1. D.I. 58-1 at 13:46-54, 14:22-28. Examples 2 and 3 also confirm that haploid maize embryos may be contacted with a doubling agent based on identification of a marker (e.g., GFP), illustrating that the wherein clause of part (b) and part (c) can be carried out together. *Id.* Parts (c) and (d) can also overlap because, as Dr. Moose explains, the doubling agent in Examples 2 and 3 is mixed into a non-callus promoting medium, illustrating that as doubled haploid maize embryo cells develop during part (c), they are already being cultured on a non-callus promoting medium in part (d). Ex. 4, ¶¶ 35, 45-47. Syngenta's argument that each claim step requires a distinct, “completed result” is thus incorrect. *Supra*, § IV.E.a. Furthermore, both parts (d) and (e) are directed to promoting the growth of a doubled haploid maize plant, and thus may also overlap. *Interactive Gift*, 256 F.3d at 1343 (rejecting an order-of-steps construction in view of the specification's disclosures).

Syngenta's reliance on *Viatech* and other cases is thus inapposite, because the “grammar, logic, the specification, or the prosecution history” of the '846 patent *do not require* Syngenta's alleged sequence of claim steps. Ans Br., 4-7; *Viatech Techs.*, 2020 U.S. Dist. LEXIS 90292 at *11-12. Nowhere is there “any disclaimer of any other order of steps, or any prosecution history indicating a surrender of any other order of steps.” *Altiris, Inc. v. Symantec Corp.*, 318 F.3d 1363, 1371 (Fed. Cir. 2003). Moreover, Syngenta identifies no authority permitting punctuation to trump the specification in a claim construction analysis, contrary to the guidance of *Phillips*. 415 F.3d at 1315 (claims “must be read in view of the specification, of which they are a part”); *I/P Engine*,

Inc. v. AOL, Inc., 874 F. Supp. 2d 510, 524 (E.D. Va. 2012) (rejecting order-of-steps construction, notwithstanding use of semicolons in claim steps).

Pioneer thus requests that the Court adopts its plain-and-ordinary meaning construction and reject Syngenta’s incorrect construction.

4. Syngenta’s Sur-Reply Position

Syngenta’s construction of 1(b) gives effect to each word and clause and is consistent with intrinsic evidence and canons of construction.

a. 1(b)’s wherein clause is subject to the time limitation of the opening clause.

The structure and grammar of 1(b) require that the wherein clause is subject to the time limitation of the opening clause of 1(b). The wherein clause defines the actions encompassed within the “isolating” step—the process of “isolating” is one *wherein* a haploid maize embryo “is distinguished...via expression of a marker.” The claim expressly requires that “isolating” occur “between 4-21 days after step (a)” and the process of “isolating” expressly requires that haploid embryos are “distinguished”—a completed action. By requiring a completed action, the claim’s plain language requires that distinguishing haploid embryos via marker expression also must be completed “between 4-21 days after step (a).”

A two-part test determines whether the claims require a specific order. *See Altiris, Inc. v. Symantec Corp.*, 318 F.3d 1363, 1369 (Fed. Cir. 2003). First, courts look to the claim language to determine if logic or grammar requires performance of the steps in the order written. *Id.* at 1370. If not, courts examine the rest of the specification and whether it “directly or implicitly requires such a construction.” *Id.* Here, joining the active verb “isolating” with the past participle “distinguished” conveys that at the time of extraction, embryos have already been distinguished. This matches Pioneer’s assertion that 1(b)’s “distinguished...does not require any ‘action’” (*supra*,

§ IV.A.3), and is supported by the specification. *See, e.g.*, ’846, 2:26–27 (“(b) selecting a haploid embryo which does not express a marker gene”). The claim language requires performance of Claim 1’s steps in a particular order, and while that is all that is required, the specification also confirms Syngenta’s sequential construction. *See, e.g., supra*, § IV.E.

Beyond that, Pioneer’s argument that the term “distinguished” is not a past participle, but a verb in passive voice, fails. In *Collaborative Agreements, LLC v. Adobe Systems, Inc.*, the court rejected an identical argument where the parties disputed whether a wherein clause containing a past participle limited the opening clause of a method claim. 14-CV-356-LY, 2015 U.S. Dist. LEXIS 61786, at *23–26 (W.D. Tex. May 12, 2015). The clause read: “*wherein...(b) all of the one or more electronic documents are locked against future changes.*” *Id.* at *24. The parties disputed whether this phrase required electronic documents to be locked when received, or included receiving an unlocked document that is subsequently locked. *Id.* at *25. The losing party argued that “the language ‘are locked against future changes’ is present tense, not past tense,” and that “had the patentee intended that the electronic document be locked upon receipt, the language would have been past tense: ‘were locked against future changes.’” *Id.* at *24–25. The court flatly rejected this argument because it “ignores the wherein clause that is part of the claim sentence,” which “limits the scope of the receiving step of the claim to a situation wherein certain conditions are actually met.” *Id.* at *25.

Here Pioneer makes the same error as the losing party in *Collaborative*: that the “is distinguished” language of 1(b) is a “present-tense, passive-voice limitation” because the helping verb “is” is present tense and not past tense. Pioneer also “ignores the wherein clause that is part of the claim sentence. This clause limits the scope of the [isolating] step of the claim to a situation wherein certain conditions are actually met.” *Id.* Notably, Pioneer offers no authority for wholly

severing a wherein clause from the claim step in which it appears. Accordingly, the Court should reject Pioneer's "present-tense, passive-voice limitation" argument, and adopt Syngenta's construction.

b. Syngenta's construction does not offend canons of construction.

Pioneer's reliance on the principle of claim differentiation incorrectly conflates two distinct temporal limitations: (1) the period prescribed in Claim 1(b), during which embryos are "distinguished...via expression of a marker," and (2) the period prescribed in Claim 5, during which "said marker gene is expressed." *See supra*, § IV.A.3. As written, the haploid maize embryo "is distinguished...via expression of a marker," and this happens "between 4-21 days after step (a)."⁷ Although 1(b) relates to the timing of marker gene expression, 1(b) does not provide a specific timeframe during which such expression must occur. Conversely, Claim 5 recites the specific timeframe during which marker gene expression must occur, as well as the location of marker gene expression ("in embryo tissue") because of Claim 5's dependency on Claim 2.

Although the timing requirements of Claims 1 and 5 are related, Claim 5 separately provides the timing for marker gene expression, "4 or more days after pollination," whereas Claim 1(b) provides a window in which embryos are distinguished, 4-21 days after pollination. Syngenta's construction does not violate the principle of claim differentiation because it accurately reflects that Claim 5 adds a limitation separate from that already present in 1(b).

⁷ Indeed, the Examiner purposefully amended the claims to require that an embryo "is distinguished" between 4-21 days after step (a) rather than accepting that a haploid embryo "is distinguishable." D.I. 58-2 at PNR_DH_00000428-29.

c. Syngenta’s construction does not exclude embodiments.

Pioneer argues that Syngenta’s construction should be rejected because it “exclud[es] preferred embodiments of the specification, including Examples 2 and 3.” *Supra*, § IV.A.3. As a threshold matter, the language of the claims controls, and whether the specification includes embodiments broader than the explicit scope of the claims is not dispositive of whether a construction is proper. *See Altiris*, 318 F.3d at 1369; *PSN Illinois v. Vivadent*, 525 F.3d 1159, 1166 (Fed. Cir. 2008). The scope of Pioneer’s claims depends on the claims themselves, not on broader embodiments it wants the claims to cover. *Collaborative*, 2015 U.S. Dist. LEXIS 61786, at *25 (“Here, however, the claims are actually narrower than the specification may support.”). Not even Pioneer argues that the claim should be construed to cover all examples in the ’846 patent. For example, Example 7 is well-outside the scope of the claims because it immerses plant roots in a doubling agent instead of an embryo. ’846, 16:45–59. The broadly-drafted specification does not, as Pioneer baldly asserts, “foreclose[]” Syngenta’s sequential construction. *Supra*, § IV.A.3. Indeed, the ’846 patent claims are narrower than the entirety of the specification. The claim language—not the specification—controls. *Digital Biometrics, Inc. v. Identix, Inc.*, 149 F.3d 1335, 1344 (Fed. Cir. 1998) (“The actual words of the claim are the controlling focus.”).

d. Syngenta’s construction is consistent with the prosecution history.

Pioneer’s claim construction seeks to recapture what it gave up during prosecution. During prosecution Pioneer offered a version of Claim 1 in which the wherein clause was not joined to any particular step and in which expression of a marker was not required. D.I. 58-2 at PNR_DH_00000327.

1. (Currently Amended) A method of obtaining a doubled haploid maize plant comprising:
 - a) pollinating silks of a maize ear with ~~an~~ a maize inducer line to produce diploid maize embryos and at least one haploid maize embryo;
 - b) contacting said haploid maize embryo with a chromosome doubling agent to produce at least one doubled haploid maize embryo cell, and ;
 - c) generating a doubled haploid maize plant from said doubled haploid maize embryo cell, and;
 - d) wherein step (b) occurs 4-21 days after step (a) and wherein said at least one haploid maize embryo is distinguishable from the diploid maize embryos.

The Examiner rejected this claim as unsupported because the specification describes “distinguishable” only as based on use of a marker gene. *Id.* at PNR_DH_00000340, 364. In response, Pioneer added that the embryos are distinguishable “via expression of a marker.” *Id.* at PNR_DH_00000374.

Listing of Claims:

1. (Currently Amended) A method of obtaining a doubled haploid maize plant comprising:
 - a) pollinating silks of a maize ear with a maize inducer line to produce at least one diploid maize embryos and at least one haploid maize embryo;
 - b) contacting said haploid maize embryo with a chromosome doubling agent to produce at least one doubled haploid maize embryo cell, and;
 - c) generating a doubled haploid maize plant from said doubled haploid maize embryo cell, wherein step (b) occurs 4-21 days after step (a) and wherein said at least one haploid maize embryo is distinguishable from the diploid maize embryos via expression of a marker.

Nevertheless, the Examiner required additional amendments that (1) joined the wherein clause to a new “isolating” step and (2) changed “distinguishable” to “distinguished.” *Id.* at PNR_DH_00000428–29.

1. (Currently amended). A method of obtaining a doubled haploid maize plant, said method comprising:

(a) pollinating silks of a maize ear with a maize inducer line to produce at least one diploid maize embryo and at least one haploid maize embryo;

(b) isolating said haploid maize embryo between 4-21 days after step (a), wherein said at least one haploid maize embryo is distinguished from the diploid maize embryos via expression of a marker;

(c) contacting said haploid maize embryo with a chromosome doubling agent to produce at least one doubled haploid maize embryo cell;~~and~~

(~~ed~~) culturing said doubled haploid maize embryo cell on a non-callus promoting medium; and

(e) generating a doubled haploid maize plant from said doubled haploid maize embryo cell;~~wherein step (b) occurs 4-21 days after step (a) and wherein said at least one haploid maize embryo is distinguishable from the diploid maize embryos via expression of a marker.~~

Pioneer agreed to the Examiner’s amendments, and the claim issued as Claim 1. Now Pioneer seeks a construction to undo the amendments it made to secure allowance. Pioneer should not now be allowed through claim construction to effectively remove the wherein clause from 1(b) and change the tense of “distinguished.” *See Schriber-Schroth Co. v. Cleveland Trust Co.*, 311 U.S. 211, 220–21 (1940) (“It is a rule of patent construction consistently observed that a claim in a patent as allowed must be read and interpreted with reference to claims that have been cancelled or rejected, and the claims allowed cannot by construction be read to cover what was thus

eliminated from the patent.”); *Festo Corp. v. Shoketsu Kinzoku Kogyokabushiki Co.*, 535 U.S. 722, 734 (2002) (“[patentee’s] decision to forgo an appeal and submit an amended claim is taken as a concession that the invention as patented does not reach as far as the original claim”); *Nite Glow Indus. v. Cent. Garden & Pet Co.*, No. 2020-1897, 2021 U.S. App. LEXIS 20791, at *31 (Fed. Cir. July 14, 2021) (“It is well established by Supreme Court cases that disclaimer can be determined from the applicant’s amendment or cancellation of claims—not just from statements made by the applicant.”).

B. Claim 1(c) Terms

Claim Terms/Phrases	Pioneer’s Proposed Construction	Syngenta’s Proposed Construction
1. (c) contacting said haploid maize embryo with a chromosome doubling agent...	<p><i>No construction needed and should be understood according to its plain and ordinary meaning.</i></p> <p>Alternatively, Pioneer proposes construing the claim terms/phrases as follows:</p> <p>“Contacting the at least one haploid maize embryo with a chromosome doubling agent.”</p>	“contacting the extracted haploid maize embryo of step (b) with a doubling agent”

1. Pioneer’s Opening Position

Part (c) of claim 1 also requires no construction because its plain and ordinary meaning is clear. Claim 1 requires “contacting said haploid maize embryo with a chromosome doubling agent.” As the ’846 patent explains, “chromosomes can be doubled at the immature embryo stage” by contacting a haploid maize embryo with a chromosome doubling agent. D.I. 58-1 at 4:1-21. To perform this doubling, the patent identifies known chromosome doubling agents such as colchicine, pronamide, dithiopyr, and trifluralin. *Id.* at 6:23-33, claim 9. Claim 1 further recites that the contacting step “produce[s] at least one doubled haploid maize cell,” which refers to the known result of doubling the haploid chromosomes in a maize cell. *Id.* at 1:39-55.

Syngenta’s construction inexplicably removes “chromosome” from “chromosome doubling agent,” and thus is less precise and less helpful to the jury than the plain claim language. Syngenta also incorrectly seeks to impose a rigid order between parts (b) and (c) of claim 1. As discussed above, Syngenta incorrectly proposes construing part (b) to require that the marker gene *has expressed* (i.e., past tense). In part (c), Syngenta further adds a requirement of using a haploid maize embryo “of step (b),” which appears to require past-tense marker expression (among other things). This added order-of-steps requirement is incorrect for multiple reasons.

First, by reading in additional limitations, Syngenta’s proposed construction excludes preferred embodiments. *See Epos Tech. Ltd. v. Pegasus Tech. Ltd.*, 766 F.3d 1388, 1347 (Fed. Cir. 2014) (“[A] claim construction that excludes a preferred embodiment... is rarely, if ever correct....”). The ’846 patent describes embodiments that proceed *immediately* from isolating (part (b)) to contacting (part (c)), without any requirement for marker expression. *E.g.*, D.I. 58-1 at 7:60-63 (if an “embryo is isolated the doubling agent may come in contact *immediately after isolation*”); *id.* at 6:1-12 (“The haploid cells may come in contact with the doubling agent... *anytime* after pollination.... The haploid embryo may be isolated.”).

Second, Syngenta’s proposed construction is legally incorrect because it seeks to limit part (c) of claim 1 to specific examples in the ’846 patent. In Examples 2 and 3, for example, the specification describes expression of a GFP (green fluorescent protein) marker in the diploid embryos, discarding the diploid embryos, and culturing the remaining haploid embryos on media containing chromosome doubling agent. D.I. 58-1 at 13:45-54; 14:20-28. It is axiomatic, however, that patent claims are not limited to examples in the specification. *See GE Lighting Sols., LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1308-10 (Fed. Cir. 2014) (“[I]t is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment....”).

Third, claim 1's use of open "comprising" language is also fatal to Syngenta's improper importation of unclaimed elements. Claim 1 encompasses methods that do not prohibit contacting haploid *and* diploid maize embryos with a chromosome doubling agent. *Multilayer Stretch Cling Film Holdings, Inc. v. Berry Plastics Corp.*, 831 F.3d 1350, 1358 (Fed. Cir. 2016) ("comprising" language creates a presumption that the "claim does not exclude additional, unrecited elements"). The claim language does not require waiting to distinguish haploids and diploids via marker expression (or even to discard the diploid embryos). Accordingly, claim 1 allows for overlap between parts (b) and (c), permitting skilled artisans to isolate and contact maize embryos with a doubling agent at an early time and distinguish the haploids and diploids at a later time once the marker gene expresses. *Kaneka Corp. v. Xiamen Kingdomway Group Co.*, 790 F.3d 1298, 1306 (Fed. Cir. 2015) ("The claims do not exclude a continuous process, in which later steps are initiated as soon as at least some product from the previous step forms, while previous steps are still ongoing."); *Mformation Tech., Inc. v. Research in Motion Ltd.*, 764 F.3d 1392, 1398 (Fed. Cir. 2014) ("As a general rule, '[u]nless the steps of a method [claim] actually recite an order, the steps are not ordinarily construed to require one.'" (citation omitted)).

Accordingly, no construction of claim 1, part (c) is necessary because a skilled artisan would have reasonably understood its requirements. In the alternative, Pioneer's plain and ordinary meaning construction is well supported by the intrinsic evidence and should be adopted.

2. Syngenta's Answering Position

The intrinsic evidence requires contact with a doubling agent (step 1(c)) to occur after isolating haploid from diploid embryos (step 1(b)). Syngenta's proposed construction of step (c) embraces the sequential order of steps required by the plain and ordinary meaning of the phrase in the context of the entire claim, specification, and prosecution history. Pioneer seeks to read-out the

sequential nature of steps (b) and (c), rewriting the claim to remove step (c)’s anaphoric reference to step (b).

First, the plain language of claim 1 supports Syngenta’s proposed construction. The purpose of step (a) is “to produce *at least one* haploid maize embryo;” and the product of step (a) is the “*at least one* haploid maize embryo.” Step (b) expressly occurs “after step (a),” and contemplates first having distinguished between the products of step (a) (i.e., the “said *at least one* haploid maize embryo” vs. “the diploid maize embryos”). Then, after having distinguished the embryos, step (b) contemplates “isolating said haploid maize embryo.” The claim uses different language to refer to the haploid maize embryo to be distinguished before “isolating” (i.e., “*at least one* haploid maize embryo”) and the haploid maize embryo to be isolated during and after the “isolating” process.

As discussed above, despite using the “*at least one* haploid maize embryo” term several times in claim 1, step (c) expressly contemplates contacting the “haploid maize embryo with a chromosome doubling agent.” Step (c) does *not* contemplate contacting the “*at least one* haploid maize embryo” with a doubling agent. Indeed, step (c)’s direct invocation of the antecedent introduced by step (b) is meant to convey that step (c) follows step (b). *See Mformation*, 764 F.3d at 1398–1400. Syngenta’s proposed construction captures this plain and ordinary meaning by referring to “the extracted haploid maize embryo of step (b).”

Pioneer contends that the “comprising” language also permits steps (b) and (c) to overlap, “permitting skilled artisans to isolate and contact maize embryos with a doubling agent at an early time and distinguish the haploids and diploids at a later time once the marker gene expresses.” *Supra*, § IV.B.1. This contention, however, rests upon the incorrect premise that “comprising” in the preamble of a claim renders every part of the claim open-ended. Not so. “The presumption

raised by the term ‘comprising’ does not reach into each of the [claim’s] steps to render every word and phrase therein open-ended.” *Dippin’ Dots, Inc. v. Mosey*, 476 F.3d 1337, 1343 (Fed. Cir. 2007). All the steps of a method claim “must...be practiced as recited in the claim.” *Id.* In short, “‘comprising’ does not free the claim from its own limitations.” *BASF Agro B.V. v. Makhteshim Agan of N. Am., Inc.*, 519 F. App’x 1008, 1017 (Fed. Cir. 2013).

Additionally, Pioneer’s overlapping construction defies logic. For steps (b) and (c) to overlap, one must disregard the plain language of the claims. As discussed above, step (b) contemplates distinguishing the “at least one haploid maize embryo” from the diploid maize embryos, and isolating the “haploid maize embryo.” Step (c) recites “contacting [the] haploid maize embryo with a chromosome doubling agent,” resulting in “at least one doubled haploid maize embryo cell.” The actions described in step (b) are performed on a “haploid maize embryo,” not on a “doubled haploid maize embryo cell.” Put plainly, Pioneer cannot rewrite its claims simply because it used “comprising” in the preamble of its claim: “Comprising is not a weasel word with which to abrogate claim limitations.” *Spectrum Int’l, Inc. v. Sterlite Corp.*, 164 F.3d 1372, 1380 (Fed. Cir. 1998).

Second, the embodiments disclosed in the specification require first isolating haploid embryos, then treatment with a doubling agent. ’846, 13:21–22(Example 1); 13:49–54(Example 2); 14:24–27(Example 3).

Pioneer argues that Syngenta’s construction would exclude preferred embodiments, but fails to explain which embodiments are preferred and which, if any, are excluded.⁸ *See supra*, § IV.B.1. What Pioneer does cite is not excluded under Syngenta’s proposed construction. First,

⁸ Pioneer also implies there is a preferred embodiment in which steps (b) and (c) have occurred without marker expression but, Pioneer does not cite evidence of any such embodiment and no such embodiment exists in the ’846 patent.

'846, 1–12 is not an embodiment; it is a statement that “If the embryo is isolated the doubling agent may come in contact immediately after isolation and before germination.” This is consistent with, and supports, Syngenta’s proposal—the extracted haploid maize embryo of step (b) can come in contact with the doubling agent immediately after it is extracted.

Next, Pioneer cites to '846, 6:1–12, which provides a number of permutations for the timing of contact with a doubling agent, some within the scope of the claim and some outside the scope of the claim. For example, if a haploid embryo has not yet been generated by the pollinating in step (a), it would be impossible for the non-existent embryo to be exposed to a doubling agent “at the time of pollination” as Pioneer suggests. Not even Pioneer will argue that the claim covers use of a doubling agent “at the plant stage” because the claims expressly recite that the doubled haploid maize plant is generated after culturing a doubled haploid maize cell. Nevertheless, Syngenta’s proposed construction is supported by the description Pioneer cites: “The haploid maize embryo may come in contact with the doubling agent...typically 6 hours to 21 days after pollination.” '846, 6:6–12. Although the claim explicitly claimed less by requiring isolation 4–21 days after step (a), this is consistent with Pioneer cancelling claims with no time limitations.⁹ See *PSN Illinois v. Vivadent*, 525 F.3d 1159, 1166 (Fed. Cir. 2008) (“[D]uring prosecution, an applicant may have cancelled pending claims but not amended the specification to delete disclosure relevant only to the cancelled claims. In such cases, unasserted or cancelled claims may provide ‘probative evidence’ that an embodiment is not within the scope of an asserted claim”).

Pioneer’s claims are narrower than the embodiments illustrated in the specification because Pioneer chose to abandon them during prosecution and pursue a claim scope narrower than what

⁹ For example, original claim 10 required “contacting said haploid seed with a chromosome doubling agent” but placed no limitations on timing. D.I. 58-2, PNR_DH_00000047.

it described in the patent. Put plainly, the scope of Pioneer's claims depends on the claims themselves, not on the broader embodiments they wish their claims would cover or that they abandoned during prosecution. Pioneer cannot use claim construction to broaden their claims.

Third, the prosecution history requires that the chromosome doubling of step (c) occur after the isolating of step (b). The Examiner's reason for allowing claim 1 to issue requires isolation before contact with a doubling agent. In the Notice of Allowance, the Examiner reasoned the claims were not obvious over cited prior art because "the period of time between pollination and generation of the doubled haploid maize plant...is short, compared to what is taught or suggested in the prior art, *due to the treatment of isolated immature maize embryos with a chromosome doubling agent*." D.I. 58-2, PNR_DH_00000428–29. In other words, the claims issued because they are directed to treating embryos with a doubling agent after they have been isolated. Thus, the isolating step must precede the contacting step. *See Arendi S.A.R.L. v. Google LLC*, 882 F.3d 1132, 1136 (Fed. Cir. 2018) (the examiner's "Reasons for Allowance" clarified what the amended claim required); *ACCO Brands, Inc. v. Micro Sec. Devices, Inc.*, 346 F.3d 1075, 1078–79 (Fed. Cir. 2003) (Reasons for Allowance made "clear that the examiner and the applicant understood" what was changed and what the invention required).

The Court should adopt Syngenta's proposed construction because it is well-supported by intrinsic evidence and the plain language of the claims.

3. Pioneer's Reply Position

Syngenta fails to meaningfully address the parties' core dispute over whether claim 1 requires distinguishing the haploid maize embryo via expression of a marker in claim 1, part (b) before contacting it with a chromosome doubling agent in part (c).

As Pioneer explained in its opening brief, Examples 2 and 3 describe expression of a GFP marker in diploid embryos, discarding the diploid embryos, and contacting the remaining haploid

embryos on media containing chromosome doubling agent (e.g., colchicine or pronamide). D.I. 58-1 at 13:45-54; 14:20-28. But it is well-settled law that patent claims are not limited to examples in the specification. *See, e.g., GE Lighting*, 750 F.3d at 1308-10. It is therefore improper to read in a timing requirement for marker expression in relation to contacting with a doubling agent based on these examples, particularly because dependent claim 5 separately recites a time period for marker expression that is independent from contacting with a doubling agent. Syngenta fails to respond to this argument, providing only a bare citation to Examples 2 and 3 in its brief. *See supra*, § IV.B.2.

It would also be particularly inappropriate to adopt Syngenta's rigid order of steps when the specification describes *broader* embodiments than in Examples 2 and 3. For example, as Dr. Moose explains, the specification discloses proceeding *immediately* from isolation to contacting with a chromosome doubling agent, without any requirement for intermediate marker expression or distinguishing between haploid and diploid embryos:

“The chromosome doubling agent may come into contact with the embryo at various times. If the *embryo is isolated* [note: no limitation as to haploid or diploid embryos] the doubling agent may come into contact *immediately* after isolation and before germination.”

D.I. 58-1 at 7:59-62; Ex. 4, ¶¶ 31-35. In response, Syngenta refers only to the “isolated” portion of the above-quoted disclosure, disregarding the absence of any requirement for marker expression or distinguishing haploid and diploid embryos before contacting them with a chromosome doubling agent. *Supra*, § IV.B.2. Syngenta also does not dispute that the '846 patent discloses contacting haploid embryo cells with the doubling agent “anytime,” with no prior requirement of marker expression or distinguishing. D.I. 58-1 at 6:1-12; *Supra*, § IV.B.2. These broader disclosures weigh strongly against reading narrower, limiting features into claim 1 as Syngenta's construction seeks to do. *AIP Acquisition LLC v. Cisco Sys., Inc.*, 714 F. Appx. 1010, 1016 (Fed.

Cir. 2017) (it is a “cardinal sin” to read limitations from the specification into the claims) (quoting *Phillips*, 415 F.3d at 1319-20).

Moreover, because no explicit timing limitation (e.g., “after step (b)”) is present in part (c), the open-ended comprising language of claim 1 permits overlap between the requirements of part (b) (e.g., marker expression and distinguishing) and contacting with a doubling agent in part (c). *Cybersettle*, 243 Fed. Appx. at 609 (“Absent affirmative indication to the contrary, method steps need not be performed in the order in which they are recited.”); *Kaneka*, 790 F.3d 1298 at 1306.¹⁰ This is also confirmed by Examples 2 and 3, where “haploid embryos, *based on the absence of the GFP marker expression*, were cultured on a medium” comprising a chromosome doubling agent. D.I. 58-1 at 13:49-54 (colchicine), 14:20-28 (pronamide).

Syngenta also incorrectly relies on a red-herring argument that the “actions described in step (b) are performed on a ‘haploid maize embryo,’ not on a ‘doubled haploid maize embryo cell.’” *Supra*, § IV.B.2. Syngenta does not dispute that a haploid maize embryo is present during part (c), as claim 1 expressly recites. Thus, a haploid maize embryo may be distinguished via expression of a marker during overlapping parts (b) and (c), consistent with the absence of a timing requirement for marker expression in claim 1 and the separate recitation of a timing requirement in claim 5. As Dr. Moose explains, haploid and diploid embryos may be distinguished via expression of a marker regardless of whether one of the cells within that embryo has been doubled in part (c). Ex. 4, ¶ 30. Nothing in claim 1 requires distinguishing between individual maize cells within an embryo.

¹⁰ Syngenta’s cited cases fail to support its position, as none dealt with an open-ended “comprising” limitation in the context of an order-of-steps dispute. *See Dippin’ Dots*, 476 F.3d at 1343 (construing “beads” of a dairy composition); *BASF*, 519 F. Appx. at 1017 (evaluating disclaimer of barrier treatments); *Spectrum*, 164 F.3d at 1380 (evaluating prosecution history estoppel).

The remainder of Syngenta’s arguments rehash a point that is generally not in dispute—i.e., that each haploid embryo is isolated (i.e., extracted) before it is contacted with a chromosome doubling agent. Claim 1, however must be construed to be broad enough to encompass the embodiments of the specification where embryos are contacted with a chromosome doubling agent *immediately* after isolation, without first distinguishing haploid versus diploid embryos via marker expression. On this point, Syngenta provides little defense of its improperly narrow construction, which should be rejected.

4. Syngenta’s Sur-Reply Position

The dispute concerning 1(c) is whether the claim requires that 1(b)’s “haploid maize embryo is distinguished...via expression of a marker” occurs before 1(c)’s contacting the “haploid maize embryo with a chromosome doubling agent to produce at least one doubled haploid maize embryo cell.” In light of two facets of the intrinsic evidence, 1(b) necessarily must occur before 1(c).

First, the language referring to embryos evolves from 1(b) to 1(c), indicating a natural progression from 1(b)’s “haploid maize embryo” to 1(c)’s subsequent “doubled haploid maize embryo cell.” There is no dispute that 1(b)’s “isolating” action is performed on a maize kernel to extract from that kernel a “haploid maize embryo.” There also is no dispute that what “is distinguished...via expression of a marker” in 1(b) also is a “haploid maize embryo.” In turn, the starting point for 1(c) is the product of 1(b)—an extracted “haploid maize embryo” that has been distinguished from the unwanted “diploid maize embryos.” Consistent with the plain language of the claim, 1(c)’s “contacting” action is performed on the extracted “haploid maize embryo” and the product of 1(c) is a “doubled haploid maize embryo cell.” The claim nowhere refers to a *doubled* haploid maize embryo or that such an embryo “is distinguished” from anything. Therefore, 1(b) must be performed before 1(c) for the simple reason that the product of an action

(i.e., a “doubled haploid maize embryo cell”) cannot occur before the action that produces the product. (i.e., “contacting...with a chromosome doubling agent”).

In contrast, Pioneer’s rationalizes its scrambled-order construction by breaking 1(b) into two steps. Pioneer does not dispute that 1(b)’s “isolating” action must be performed before 1(c)’s “contacting” action. *Supra*, § IV.B.3. Pioneer argues instead that embryos can be “distinguished” at any time, even after embryos are “doubled,” even though the claim does not recite that “doubled” embryos are produced, much less distinguished. However, as discussed above, the plain language of the claim’s wherein clause does not support severing 1(b) into separate steps. *See supra* § IV.A.4.

Second, 1(b) concerns a “haploid maize embryo,” not a “*doubled* haploid embryo”—a term that is lexicographically defined in the specification separately from its undoubled counterpart. *Compare* ’846, 18:34–36 (claim 1(b) reciting “haploid maize embryo”), *with id.*, 1:54–55 (defining “doubled haploid embryo”). Nor is “*doubled* haploid embryo” mentioned in 1(c), which refers only to the resulting “doubled haploid maize embryo *cell*.” *See supra*, § IV.D.3. (“[t]he plain language of claim 1 differentiates between haploid maize plants, embryos, and cells.”).

As written, claim 1 does not recite “*doubled* haploid maize embryos” and instead recites in 1(b) “at least one haploid maize embryo is distinguished from the diploid maize embryos” and in 1(c) “said haploid maize embryo” produces a “doubled haploid maize embryo cell.” Thus, the claim, the specification, and even Pioneer in its Reply Brief acknowledge the difference between an embryo and a cell. *Id.* The “embryo cell” of 1(c) is distinct from the “embryo” of 1(b) and there is no logical flow from 1(b)’s opening clause “embryo” to 1(c)’s “embryo cell” and back to 1(b)’s “embryo” as Pioneer’s construction allows. Accordingly, the Court should reject Pioneer’s construction in favor of Syngenta’s construction.

C. Claim 1(d) Terms

Claim Terms/Phrases	Pioneer's Proposed Construction	Syngenta's Proposed Construction
1.(d) culturing said doubled haploid maize embryo cell on a non-callus promoting medium	<p><i>Not indefinite.</i></p> <p><i>No construction necessary and should be understood according to its plain and ordinary meaning.</i></p> <p>Alternatively, Pioneer proposes construing the claim terms/phrases as follows:</p> <p>“Culturing the doubled haploid maize embryo cell on a non-callus promoting medium.”</p>	Indefinite

1. Pioneer's Opening Position

Part (d) of claim 1 is also clear to a skilled artisan, and therefore no construction is necessary. The specification and prosecution history illustrate the difference between using the claimed methods to produce doubled haploid maize *plants* as compared to prior art methods requiring development of embryogenic maize *callus*, defined as a “de-differentiated proliferating mass of cells or tissue.” D.I. 58-1 at 1:56-57, 8:67-9:2; D.I. 58-2 at PNR_DH_00000299-300. Moreover, the '846 patent provides an express definition of a non-callus promoting medium: “a medium that does not support proliferation of dedifferentiated masses of cells or tissue.” D.I. 58-1 at 8:65-9:18. A skilled artisan would have understood this term in context based on at least the clear definition in the specification. *See Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380 (Fed. Cir. 2009) (“When a patentee explicitly defines a claim term in the patent specification, the patentee’s definition controls.”); *see also Personalized Media Comm., LLC v. Int’l Trade Com’n*, 161 F.3d 696, 705-06 (Fed. Cir. 1998) (finding claim term sufficiently definite because it was defined in the specification). The specification refers to various non-callus promoting media throughout the specification and Examples, including known embryo rescue

media, embryo maturation medium, and shoot proliferation media. *E.g.*, D.I. 58-1 at 9:2-18, 17:34-39 (“rooting is promoted by culture on MS (Murashige and Skoog) or SH (Shenk and Hildebrandt) medium”).

Syngenta’s indefiniteness allegation should be rejected. The differences between non-callus promoting media and media that promote forming callus tissue would be plainly evident to a skilled artisan. As shown in Figure 2 below, for instance, a skilled artisan would have readily distinguished between selecting media that promotes growth of the dedifferentiated mass of tissue known as “callus” as compared to culturing a doubled haploid maize cell on a “non-callus-promoting medium” to promote generating a doubled haploid maize plant. D.I. 58-1 at 1:56-57.

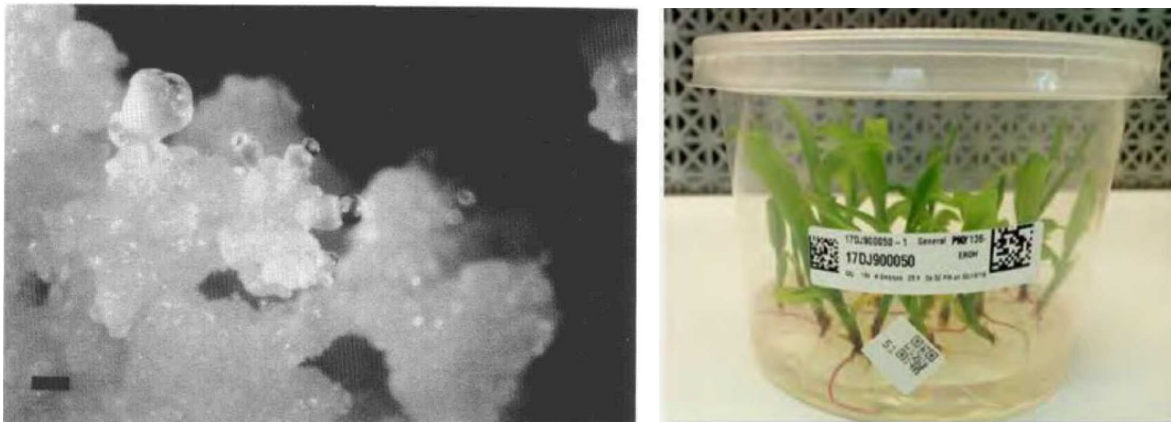


Figure 2. Maize callus formation (left; Ex. 2¹¹ at Fig. 2B) versus maize germination using non-callus promoting media (right; D.I. 1-5 at 28).

Accordingly, no construction of claim 1, part (d) is necessary because a skilled artisan would have reasonably understood its requirements. In the alternative, Pioneer’s plain and ordinary meaning construction is well supported by the intrinsic evidence and should be adopted.

¹¹ Ex. 2 is cited in the ‘846 patent (D.I. 58-1) at 12:7-17.

2. Syngenta's Answering Position

Claim step (d) lacks the requisite precision of scope for patentability, rendering the claim indefinite.

“The primary purpose of the definiteness requirement is to ensure that the claims are written in such a way that they give notice to the public of the extent of the legal protection afforded by the patent, so that interested members of the public, *e.g.*, competitors of the patent owner, can determine whether or not they infringe.” *Oakley, Inc. v. Sunglass Hut Int’l*, 316 F.3d 1331, 1340 (Fed. Cir. 2003). “[A] patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). To comply with § 112, a patent “must provide objective boundaries for those of skill in the art.” *Id.* Indefiniteness is a question of law resolvable during claim construction. *Personalized Media Commc’ns., LLC v. Int’l Trade Comm’n*, 161 F.3d 696, 705 (Fed. Cir. 1998) (“[I]ndefiniteness is a legal conclusion that is drawn from the court’s performance of its duty as the construer of patent claims.”).

The phrase “non-callus promoting media,” on its face, fails to inform, with reasonable certainty, those of skill in the art about the scope of the claim. The explicit definition of “non-callus promoting medium” in the specification fails no better. The specification defines “non-callus promoting medium” as “a medium that does not support proliferation of dedifferentiated masses of cells or tissue.” ’846, 8:66–9:2. Indeed, merely defining “non-callus promoting media” by its function as the subset of media “that do not support proliferation” of callus “leave[s] the skilled artisan to consult the unpredictable vagaries of any one person’s opinion.” *Dow Chem. Co. v. Nova Chems. Corp. (Canada)*, 803 F.3d 620, 635 (Fed. Cir. 2015) (cleaned up). This

unhelpful “what it is not” definition is akin to defining a “clothing iron” as “a device that does not support the wrinkling of fabric.”

“Non-callus promoting media” and its companion definition offer no objective indication of when a media is, or is not, callus promoting. The specification’s explicit definition of the term does not require the absence of a callus or absence of callus formation, but instead requires only that the media “does not support proliferation” of the callus. The functional definition provides no guidance from which one can discern what factors in a media would support proliferation, let alone the degree of support needed for media to cross the line from “supporting” to “*not* supporting” proliferation. *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1251, 1255 (Fed. Cir. 2008) (en banc) (“functional limitation” indefinite because it was “highly dependent on context” and could not be translated “into meaningfully precise claim scope”). The definition does not account for the fact that the media may support proliferation, be neutral to proliferation, inhibit proliferation, or may allow proliferation to occur to varying degrees. The definition is purely subjective. When a subjective term like “promoting” or “support” is used, “a court must determine whether the patent’s specification supplies some standard for measuring the scope of the [term].” *Ernie Ball, Inc. v. Earvana, LLC*, 502 F. App’x 971, 980 (Fed. Cir. 2013) (citations omitted). The standard “must provide **objective boundaries** for those of skill in the art.” *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014). The ’846 patent discloses no such objective standards to provide the objective boundaries necessary for patentability.

Pioneer, fully aware of these deficiencies, avoids using the explicit definition offered by the patent. Instead, Pioneer notes: “[t]he specification and prosecution history illustrate the difference between using the claimed methods to produce doubled haploid maize *plants* as compared to prior art methods requiring development of embryogenic maize *callus*, defined as a

‘de-differentiated proliferating mass of cells or tissue.’” *Supra*, § IV.C.1. While this reference to the patent’s explicit definition of a “callus” may clarify the difference between a plant and a callus, it does nothing to “provide objective boundaries” for the *medium* that is “non-callus promoting.” To analogize again, defining “wrinkles” does not give meaning to the term “clothing iron.” Thus, the patent’s “definition” of “non-callus promoting medium” is not a phrase providing objective boundaries for those of skill in the art. *See Ernie Ball*, 502 F. App’x at 980.

Pioneer attempts to jettison its indefinite definition by claiming that “a skilled artisan would have readily distinguished between selecting media that promotes growth of the dedifferentiated mass of tissue known as ‘callus’ as compared to culturing a doubled haploid maize cell on a ‘non-callus-promoting medium’ to promote generating a doubled haploid maize plant.” *Supra*, § IV.C.1. But Pioneer defined “non-callus promoting medium,” and “[w]hen a patentee explicitly defines a claim term in the patent specification, the patentee’s definition controls.” *Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380 (Fed. Cir. 2009). Pioneer removed the ability of a skilled artisan to independently define the term, and instead chose to define the term with a vague, indefinite description. *Braintree Labs., Inc. v. Novel Labs., Inc.*, 749 F.3d 1349, 1356 (Fed. Cir. 2014) (“Under our precedent, the patentee’s lexicography *must* govern the claim construction analysis.”).

Even if a skilled artisan ventured beyond Pioneer’s definition, the examples provided in the specification are equally unhelpful. While the specification gives examples of “non-callus promoting media,” it does not explain when or how such media may or may not support proliferation. Nor does the specification explain how to test whether a medium does or does not support proliferation.

The '846 patent provides no standard or objective boundary to understand when a media is or is not “non-callus promoting.” Pioneer cannot escape the fact that “non-callus promoting media” and its definition fail to provide any meaningful description of what constitutes such a media and thereby prevents a person skilled in the art from knowing when a particular media used is or is not non-callus promoting. For the foregoing reasons, Syngenta asks the Court to deem the claim indefinite.

3. Pioneer’s Reply Position

Syngenta acknowledges that the '846 patent explicitly defines “non-callus promoting medium,” but contends that the claim 1(d) terms are indefinite because the specification allegedly “offer[s] no objective indication of when a media is, or is not, callus promoting.” *Supra*, § IV.C.2. Syngenta’s unsupported indefiniteness argument should be rejected for several reasons.

First, contrary to Syngenta’s position, a functional definition in the specification does not render a claim term indefinite. *See supra*, § IV.C.2. Rather, functional language can “promote[] definiteness because it helps bound the scope of the claims by specifying the operations that the [claimed invention] must undertake.” *Cox Commc’ns v. Sprint Commc’n Co.*, 838 F.3d 1224, 1232 (Fed. Cir. 2016); *ClearOne, Inc. v. Shure Acquisition Holdings, Inc.*, 35 F.4th 1345, 1349-51 (Fed. Cir. 2022) (confirming validity based on definiteness because the relative term “self-similar” had a well-known meaning).

Syngenta also ignores that non-callus promoting media were well known and understood, consistent with the definition in the specification. Indeed, as Dr. Moose explains, such media are taught in intro-level undergraduate classes. Ex. 4, ¶¶ 36-40. For example, to promote embryo maturation, the specification describes placing the embryo on “non-callus promoting medium,” which contains “typical salt and vitamin formulation” and “little to no auxin.” D.I. 58-1 at 9:2-6; Ex. 4, ¶ 38. A skilled artisan thus would have readily known what cell culture components to

include to support plant growth. Various non-callus promoting media are also described throughout the examples, including Example 2 using a “medium comprising MS [Murashige and Skoog] salts, MS vitamins, myoinositol, sucrose, and gelrite.” D.I. 58-1 at 13:57-58, 17:36-39; Ex. 4, ¶ 39. These disclosures are sufficiently detailed such that, when read in light of the specification, a skilled artisan would understand claim 1’s requirement to culture the doubled maize embryo cells on “non-callus promoting medium” with reasonable certainty. Ex. 4, ¶ 40. Indeed, Syngenta’s own ’632 patent similarly differentiates between callus and seedling formation, confirming these general principles. Ex. 5 at PNR_DH_00000526 (plant tissue culture media such as MS media “facilitate[s] rapid germination,” and addition of cytokinin or auxin “induce[s] embryonic callus development”).

Finally, Syngenta’s indefiniteness arguments are premature. If the Court does not fully reject Syngenta’s indefiniteness contentions, the Court should defer ruling on them until the evidentiary record is further developed through fact and expert discovery. The disputed claim terms are technical in nature and commonly used in the fields of maize breeding and genetics. Ex. 4, ¶¶ 10-17. Definiteness turns on whether a skilled artisan, based on general knowledge in the art, would have been able to ascertain the meaning and scope of the claims with reasonable certainty, and the Court would benefit from further expert and evidentiary support should it choose to consider those arguments. *See Dow*, 809 F.3d at 1225 (Moore, J., concurring) (“Appreciating what a skilled artisan knew at the time of the invention is pertinent to whether the claims are reasonably clear in their meaning and scope.”).

4. Syngenta’s Sur-Reply Position

The term “non-callus promoting media” in 1(d) renders Claim 1 indefinite. Pioneer argues that the phrase is definite merely because it is defined. Yet Pioneer’s construction avoids that

definition. That is because the specification’s definition of “non-callus promoting media” fails to inform the scope of the claim.

Pioneer also argues that the specification’s definition cannot be indefinite because “non-callus promoting media were well known and understood” and “such media are taught in intro-level undergraduate classes.” *Supra*, § IV.C.3. Assuming any of those extrinsic assertions are true, (they are not) Pioneer’s argument is still unavailing. By choosing to act as a lexicographer and defining the term “non-callus promoting media,” Pioneer removed the ability of a skilled artisan to independently ascribe meaning to the term. *Braintree Labs., Inc. v. Novel Labs., Inc.*, 749 F.3d 1349, 1356 (Fed. Cir. 2014) (“[T]he patentee’s lexicography must govern the claim construction analysis.”); *Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380 (Fed. Cir. 2009) (“[T]he patentee’s definition controls.”). Because Pioneer’s definition of “non-callus promoting media” provides no standard or objective boundary to understand when a medium is or is not “non-callus promoting,” the claim is indefinite.

D. Claim 1(e) Terms

Claim Terms/Phrases	Pioneer’s Proposed Construction	Syngenta’s Proposed Construction
1.(e) generating a doubled haploid maize plant from said doubled haploid maize embryo cell	<p><i>No construction needed and should be understood according to its plain and ordinary meaning.</i></p> <p>Alternatively, Pioneer proposes construing the claim terms/phrases as follows:</p> <p>“Generating a doubled haploid maize plant (including seeds and progeny) from the doubled haploid maize embryo cell” (emphases added)</p>	<p>“generating from the doubled haploid maize embryo cell of step (d) a doubled haploid whole plant, plant organ (e.g., leaves, stems, roots, etc.), seeds, and plant cells (e.g., seeds, suspension cultures, embryos, meristematic regions, callus tissue, leaves, roots, shoots, gametophytes, sporophytes, pollen, and microspores), and progeny of same” (emphases added)</p>

1. Pioneer's Opening Position

As shown in the table above, there is no dispute that the “doubled haploid maize plant” of part (e) encompasses seeds and progeny. That is consistent with the specification, which describes seeds and progeny as within the scope of the invention. *E.g.*, D.I. 58-1 at 1:39-43 (“A plant or seed that is obtained from a doubled haploid plant that is selfed any number of generations may still be identified as a doubled haploid plant.”); *id.* at 2:1-3 (“the term ‘plant’ includes... seeds... and progeny of same”); *id.* at 18:4-11 (Example 9 describing harvesting mature seeds and testing progeny). Thus, Pioneer submits that part (e) of claim 1 requires no construction or, in the alternative, requests that the Court adopt Pioneer’s plain and ordinary meaning construction.

Syngenta’s proposed construction should be rejected because it incorrectly seeks to incorporate the specification’s general definitions of the term “plant” (*id.* at 2:1-3) and “plant cell” (*id.* at 2:3-7) into claim 1. Claim 1 does not recite just any plant or plant cell. Rather, claim 1 recites a *doubled haploid maize plant* produced according to the method of claim 1, and thus Syngenta fails to account for the specific context of the claim. *Interactive Gift*, 256 F.3d at 1331 (“the analytical focus must begin and remain centered on the language of the claims themselves”). Claim 1 specifically recites a method for obtaining a “doubled haploid maize plant” (*see* preamble and part (e)) and distinguishes such plants from maize “embryos” and “cells.” *See, e.g.*, D.I. 58-1 at claim 1, part (e) (“generating a doubled haploid maize *plant* from said doubled haploid maize *cell*”). It is thus legal error to equate the “doubled haploid maize plant” with embryos and cells as Syngenta proposes. *Helmsderfer v. Bobrick Washroom Equipment, Inc.*, 527 F.3d 1379, 1382 (Fed. Cir. 2008) (“Our precedent instructs that different claim terms are presumed to have different meanings.”).

Syngenta’s proposed construction further errs by seeking to impose an order of steps by requiring “the doubled haploid maize embryo cell *of step (d)*” as a prerequisite for generating a

doubled haploid maize plant. In view of claim 1’s “comprising” language, a skilled artisan would understand that steps (d) and (e) can overlap, as both steps promote the growth of a doubled haploid maize plant (e.g., as opposed to maize callus tissue). D.I. 58-1 at 8:65-9:18; D.I. 58-2 at PNR_DH_00000407 (“there is no need to develop callus”).

2. Syngenta’s Answering Position

The parties dispute whether the explicit definition in the patent provides the meaning of “plant.” Syngenta’s construction of these terms precisely reflects the definition of “plant” and “plant cell” as set forth in the specifications. Conversely, Pioneer cherry-picks two words from the explicit definition—“seeds” and “progeny”—and evades the definitions chosen by the patentees.

The patentees of the patent-in-suit served as lexicographers and made clear what they meant by the terms “plant” and “plant cell.” The Federal Circuit has explained that a patentee may expressly define terms through the use of phrases like “as used herein.” *See Abbott Labs. v. Andrx Pharmas. Inc.*, 473 F.3d 1196, 1210–1211 (Fed. Cir. 2007). That is precisely what the patentees did here. The specification defines the term “plant” and “plant cell” as follows:

As used herein, the term “**plant**” includes reference to whole plants, plant organs (e.g., leaves, stems, roots, etc.), seeds and plant cells and progeny of the same. “**Plant cell**,” as used herein includes, without limitation, seeds, suspension cultures, embryos, meristematic regions, callus tissues, leaves, roots, shoots, gametophytes, sporophytes, pollen, and microspores.

’846, 2:1–7. Syngenta’s proposed construction uses exactly these definitions, and any other construction would be improper. *Braintree Labs., Inc.*, 749 F.3d at 1356 (reversing construction modifying a “clear definition” of term, stating “[u]nder our precedent, the patentee’s lexicography **must** govern the claim construction analysis.”).

Pioneer does not dispute that the specification expressly defines “plant” and “plant cell,” as a portion of their own construction reflects. Pioneer itself relies on this **exact definition** to support their cherry-picked construction. *See supra*, § IV.D.1. Pioneer offers no support for why

the word “plant” appearing in the term “doubled haploid maize *plant*” would not carry its meaning as defined in the specification. Nor does Pioneer address why it is appropriate for the Court to cherry-pick only certain words from the definition while ignoring all others.

Pioneer further contends that, because of claim 1’s “comprising” language, “steps (d) and (e) can overlap, as both steps promote the growth of a doubled haploid maize plant.” *Supra*, § IV.D.1. However, as discussed above, “‘comprising’ does not free the claim from its own limitations.” *BASF Agro B.V.*, 519 F. App’x at 1017. As claimed, step (d) is performed on a “doubled haploid maize embryo *cell*,” and is not performed on a doubled haploid maize embryo *plant*. Likewise, step (e) develops the doubled haploid maize embryo *cell* into a doubled haploid maize *plant*. Once the cell has been developed into a plant, there is no longer a cell to culture as step (d) requires. Therefore, step (d) cannot occur during or after step (e). Accordingly, Syngenta’s proposed construction comports with the sequential limitations described within the claim as written, while Pioneer’s proposed construction does not.

3. Pioneer’s Reply Position

Syngenta’s proposed construction improperly incorporates the specification’s general definitions of the term “plant” (*id.* at 2:1-3) and “plant cell” (*id.* at 2:3-7) into claim 1, ignoring claim 1’s more specific recitation of “generating a *doubled haploid maize plant*.” Syngenta also nowhere disputes that the plain language of claim 1 differentiates between haploid maize *plants*, *embryos*, and *cells*, rather than equating them as Syngenta’s incorrect construction does. *Helmsderfer*, 527 F.3d at 1382 (“Our precedent instructs that different claim terms are presumed to have different meanings.”); *Digital Biometrics, Inc. v. Identix, Inc.*, 149 F.3d 1335, 1344 (Fed. Cir. 1998) (“The actual words of the claim are the controlling focus.”). Likewise, in context, the specification repeatedly differentiates between maize *plants*, *embryos*, and *cells*, which Syngenta ignores. D.I. 58-1 at 1:39-53, 13:45-14:53. Syngenta thus provides no reasonable basis for

deviating from the ordinary meaning of “doubled haploid maize plant” and cherry-picking words from an out-of-context, broader disclosure for its construction. Ex. 4, ¶¶ 41-43.

Syngenta’s proposed construction seeking an order of steps requirement (“*of step (d)*”) should also be rejected. While part (b) of claim 1 recites a timing element (“after step (a)”), part (d) does not recite any particular order and allows for overlap with part (e). *See Provisur Tech. Inc., v. Weber Inc.*, 2022 WL 17688071 at *3 (Fed. Cir. 2022) (rejecting a narrow construction because the “claims do not recite any particular timing or order” and the specification allows for “simultaneous” processes); *Nelcor Puritan Bennett, Inc. v. Masimo Corp.*, 402 F.3d 1364, 1371 (Fed. Cir. 2005) (declining to impose specific order when steps would produce the “same result” regardless of the order). As Dr. Moose explains, a skilled would understand that part (e) may overlap with (d) because both steps promote the generation of a doubled haploid maize plant from a doubled haploid maize cell. Ex. 4, ¶ 44.

4. Syngenta’s Sur-Reply Position

Contrariwise, Pioneer argues that it is *improper* to define claim terms using the definitions that Pioneer provided in the specification. Remarkably, Pioneer avers that the term “doubled haploid maize plant” is not a “plant” as defined in the specification. *Supra*, § IV.D.3. The ’846 patent defines “plant,” and Pioneer points to no intrinsic evidence suggesting a “doubled haploid maize plant” is not a “plant.” Accordingly, the Court should reject Pioneer’s arguments on this point.

E. Claim 1 Order of Steps

1. Syngenta's Answering Position: The text and logic of Claim 1 of the '846 patent requires the five claimed steps to occur in the order written¹²

Claim 1 of the '846 patent recites a series of five steps for obtaining a doubled haploid maize plant. A fundamental dispute between the parties is whether the five steps of claim 1 must be performed in the order in which they appear. “[A] claim requires an ordering of steps when the claim language, as a matter of logic or grammar, requires that the steps be performed in the order written, or the specification directly or implicitly requires an order of steps.” *Mformation Techs., Inc. v. Research in Motion Ltd.*, 764 F.3d 1392, 1398 (Fed. Cir. 2014) (cleaned up). Here, the intrinsic evidence, including the claim’s language and structure and the specification, shows that the claim requires performance of each step sequentially in the order recited. The steps occur in a logical order in which each step refers back to the completed result of a prior step, each step is labeled sequentially by letter, and the specification describes only a method with distinct, ordered steps.

First, claim 1 is laid out in a logical, sequential order. The claim necessarily starts with step (a), in which pollinating the maize creates both haploid and diploid embryos. Next, in step (b), the haploid embryos of interest are distinguished from diploid embryos so they can be isolated for doubling “4–21 days after step (a).” The doubling of the distinguished haploid embryos follows next in step (c), which results in a “doubled haploid maize embryo cell.” Step (d) then cultures the “doubled haploid maize embryo cell,” and step (e) generates a “doubled haploid maize plant” from the cultured doubled haploid maize embryo cell. *See ViaTech Techs. v. Microsoft Corp.*, No. 17-

¹² This argument was presented in a separate section by Syngenta in its answering brief. Pioneer’s rebuttal positions to the content of this section are included *supra* in the sections for each disputed claim term.

570-RGA, 2020 U.S. Dist. LEXIS 90292, *12 (D. Del. May 22, 2020) (“The steps are laid out in a logical order which strongly suggests that they be performed in that order.”).

Beyond that, the steps of claim 1 refer back to the completed result of the prior step:

- Step (a) creates “at least one haploid maize embryo” and a “at least one diploid maize embryo” that are both referenced in step (b);
- Step (b) distinguishes between the haploid and diploid embryos of step (a) to allow extraction of the “haploid maize embryo” of interest, which is needed for the doubling in step (c);
- Step (c) uses a doubling agent on the isolated embryo from step (b) to create a “doubled haploid maize embryo cell”;
- The “doubled haploid maize embryo cell” is then cultured in step (d) and then generated into a “doubled haploid maize plant” in step (e).

When one claim step must be completed before another begins—as in claim 1—courts should construe the claim to require performance of the steps in sequential order. *E-Pass Techs., Inc. v. 3Com Corp.*, 473 F.3d 1213, 1222 (Fed. Cir. 2007) (“because the language of most of the steps of its method claim refer to the completed results of the prior step, E-Pass must show that all of those steps were performed in order”); *Hytera Communs. Co. v. Motorola Sols., Inc.*, 841 F. App’x 210, 218 (Fed. Cir. 2021) (“[A]s a matter of logic, we reject Hytera’s position that we should construe claim 7 as requiring four of its five steps to be performed in the order they are written, but we should disregard the antecedent basis in the ‘preparing’ step and allow that one step to be performed out of order”).

Second, the claim’s logical, sequential order of steps is reflected in the patentee’s choice to separately label each step sequentially (a) through (e), further indicating the claimed method proceeds in a specific order. The patentee chose to order the steps with sequential labels (a)–(e) rather than simply reciting “pollinating,” “isolating,” “contacting,” “culturing,” and “generating” without any labels. Moreover, each of the five steps are offset by semicolons, which “strongly

indicates that each step is separate and distinct.” *In re Affinity Labs of Tex., LLC*, 856 F.3d 902, 907 (Fed. Cir. 2017).

Third, the specification describes the method as occurring sequentially in discrete steps. *See, e.g.*, ’846, 2:22–30 (“a) pollinating...b) selecting a haploid embryo which does not express a marker gene; c) contacting the haploid embryo with...a doubling agent; and d) regenerating that embryo into a doubled haploid plant.”); 12:33–36 (characterizing the invention as having discrete steps: “Any or all or any combination of the various steps of the invention: embryo isolation, culturing, embryo cell doubling may be performed in the light or dark.”). Every example relating to claim 1 (Examples 1, 2, and 3) follow the sequential order of steps as recited in claim 1:

- Pollination results in haploid embryos. *Id.*, 12:63–64(Example 1); 13:45–46(Example 2); 14:20–22(Example 3).
- The haploid embryos are extracted 4-21 days after pollination based upon expression of a marker gene. *Id.*, 12:64-13:7, 13:13-22(Example 1); 13:48–50(Example 2); 14:22–26(Example 3).
- The extracted embryos are exposed to a doubling agent. *Id.*, 13:21–22(Example 1); 13:49–54(Example 2); 14:26–29(Example 3).
- After doubling, the embryos are cultured on medium without doubling agent. *Id.*, 13:22–24(Example 1); 13:54–58(Example 2); 14:29–32(Example 3).
- Finally, plantlets are generated. *Id.*, 13:24–27(Example 1); 13:58–61(Example 2); 14:31–35(Example 3).

This stepwise, sequential order is unremarkable because it proceeds according to the normal biological steps required by nature, as emphasized by Pioneer during prosecution. D.I. 58-2, PNR_DH_00000407 (“In the instant application, chromosome doubling is carried out on an entire embryo, in a streamlined fashion with only a minimum deviation from normal plant development.”).

Pioneer’s proposed construction of claim 1 ignores and contradicts this logical, sequential order and separateness of the steps.

F. Claim 5 Terms

Claim Terms/Phrases	Pioneer's Proposed Construction	Syngenta's Proposed Construction
5. ...wherein said marker gene is expressed 4 or more days after pollination.	<p><i>Not indefinite or an improper dependent claim.</i></p> <p><i>No construction needed and should be understood according to its plain and ordinary meaning.</i></p> <p>Alternatively, Pioneer proposes construing the claim terms/phrases as follows:</p> <p>“The marker gene is expressed 4 or more days after pollination.”</p>	Indefinite / § 112 ¶ 4

1. Pioneer's Opening Position

Pioneer submits that claim 5 also requires no construction because its plain and ordinary meaning is clear. Claim 5 depends from claim 2 and recites that “the marker gene is expressed 4 or more days after pollination.” The “marker gene” of claim 2 refers back to claim 1 and requires that the “inducer line” of claim 1 contain “a marker gene that is expressed in embryo tissue.” A skilled artisan would have read claim 5 as a whole and understood it to convey that the marker gene expresses 4 or more days after pollination. That understanding is also consistent with the specification, which describes a variety of different marker genes that a skilled artisan would have understood express at different times, as well as a range of preferred times for marker expression. D.I. 58-1 at 9:47-10:57.

Contrary to Syngenta's contention, claim 5 is not an improper dependent claim, i.e., allegedly broader than claim 1. *Littelfuse, Inc. v. Mersen USA EP Corp.*, 29 F.4th 1376, 1380 (Fed. Cir. 2022) (“By definition, an independent claim is broader than a claim that depends from it....”). Claim differentiation confirms that claim 5 adds a narrowing time period for marker expression

that is not present in claims 1 and 2. For example, dependent claim 5 recites a *later*, narrowing time period for marker expression (*i.e.*, “4 or more days after pollination”), whereas claims 1 and 2 encompass marker expression *earlier* than 4 days after pollination. Claim 5 thus recites a “further limitation” narrowing the scope of claims 1 and 2, complying with 35 U.S.C. § 112, fourth paragraph (pre-AIA). From the parties’ May 23, 2023 meet and confer, Pioneer understands that Syngenta’s indefiniteness theory under 35 U.S.C. § 112, second paragraph is the same, and thus it fails for at least the same reasons.

Accordingly, no construction of claim 5 is necessary because a skilled artisan would have reasonably understood its requirements. In the alternative, Pioneer’s plain and ordinary meaning construction is well supported by the intrinsic evidence and should be adopted.

2. Syngenta’s Answering Position

It is axiomatic that a dependent claim cannot be broader than the claim from which it depends. 35 U.S.C. § 112 ¶ 4 (“[A] claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed.”). A dependent claim that fails to narrow the scope of the claims from which it depends is invalid. *Pfizer, Inc. v. Ranbaxy Labs. Ltd.*, 457 F.3d 1284, 1292 (Fed. Cir. 2006) (“a violation of § 112, ¶ 4 renders a patent invalid just as violations of other paragraphs of § 112 would”).

Claim 5 is invalid because by claiming that the marker gene is expressed “4 or more days after pollination,” it covers a range larger than claimed by claim 1 in violation of 35 U.S.C. § 112 ¶ 4. As discussed above, step (b) of claim 1 requires isolation of the embryo to occur “between 4–21 days after pollination,” and, due to the presence of a wherein clause containing a past participle, the embryo must already be “distinguished via expression of a marker” at the time of isolation. *See supra*, III.A. Thus, claim 1 requires the expression of the marker to occur “between 4–21 days after pollination.” Claim 5 contradicts claim 1’s limitation that the

marker gene is expressed 4–21 days after pollination. Claim 5 adds “the marker gene is expressed 4 or more days after pollination,” which enlarges the time frame for expression beyond the 21 day limit in claim 1. Because Claim 5 would broaden the temporal limitations of the expression of the marker gene beyond the scope of Claim 1, Claim 5 is an improper dependent claim and thus invalid under 35 U.S.C. § 112.

3. Pioneer’s Reply Position

Syngenta wholly ignores Pioneer’s claim differentiation argument for claim 5. Instead, Syngenta argues that claim 5 is invalid under § 112 ¶ 4 because “it covers a range larger than claimed by claim 1.” *Supra*, § IV.F.2. This construction relies on a faulty construction of claim 1 and fails to properly evaluate marker gene expression in the context of the claimed method. Ex. 4, ¶ 48.

As detailed above, claim 1 only sets a timing requirement for “isolating” the maize embryos. Dependent claim 5 separately adds a time limitation for expression of the marker gene—i.e., “4 or more days after pollination”—which shows that no timing requirement for marker expression is present in the “wherein” clause of claim 1. *See supra* § II.A.1.

The Court should therefore reject Syngenta’s improper dependent claim theory, which is premised on an erroneous construction of claim 1 and adopt Pioneer’s construction.

4. Syngenta’s Sur-Reply Position

Pioneer’s misplaced argument about claim differentiation does not save Claim 5 either. *See supra* § IV.A.4. As a simple matter of logic, one cannot distinguish “via expression of a marker” until such marker has been expressed, and there is no dispute that “4 or more days” extends beyond “4-21 days.” Because Claim 5 contemplates marker gene expression after embryos are distinguished via expression of that marker, Claim 5 is necessarily broader than, and logically inconsistent with, Claim 1. *See Amgen Inc. v. Hospira, Inc.*, No. 15-839-RGA, 2016 U.S. Dist.

LEXIS 164744, at *10 (D. Del. Nov. 30, 2016) (finding dependent claim that improperly narrowed independent claim invalid because it “contradicts a limitation of claim 1”). Claim 5 improperly broadens Claim 1 and is invalid under 35 U.S.C. § 112 ¶ 4.

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